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Spectrum Management and Telecommunications

Consultation on a Policy and Technical Framework for the 700 MHz Band and Aspects Related to Commercial Mobile Spectrum

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1. Intent

Through the release of this paper, Industry Canada is hereby initiating a consultation on a policy and technical framework to auction spectrum in the band 698-806 MHz (also known as the 700 MHz band) as announced in *Canada Gazette* Notice No. SMSE-018-10. Comments are sought on general policy considerations related to commercial mobile broadband spectrum use, competition issues and on the use of the 700 MHz band. In addition, the Department is seeking comments on spectrum use for public safety broadband applications.

Noting that the Department will consult on licensing measures for the band 2500-2690 MHz in a separate consultation, this paper also seeks views on whether government measures are required to promote competition, in the context of spectrum being made available in both bands.

2. Policy Objectives

The Minister of Industry, through the *Department of Industry Act*, the *Radiocommunication Act* and the *Radiocommunication Regulations*, with due regard to the objectives of the *Telecommunications Act*, is responsible for spectrum management in Canada. As such, the Minister is responsible for developing national policies and goals for spectrum utilization and ensuring effective management of the radio frequency spectrum resource.

Industry Canada is committed to ensuring that Canadian consumers, businesses and public institutions continue to benefit from the availability of new, advanced and affordable telecommunications services in all regions of the country. Such services directly impact the adoption and use of digital technologies and, more generally, the competitiveness and productivity of the Canadian economy. In pursuing these objectives, the Department has acted to encourage a competitive telecommunications marketplace, as it believes that competition stimulates innovation and investment by the industry, which can lead to lower prices, better services and more choice for consumers, businesses and public sector users.

In developing a policy and licensing framework to make additional spectrum available, the Department takes into consideration the need to provide spectrum access for new services and technologies, including broadband, the impact of such a framework on all stakeholders and the *Spectrum Policy Framework for Canada* (SPFC) policy objective to maximize the economic and social benefits that Canadians derive from the use of the radio frequency spectrum.

3. Background

Cellular mobile radio services (CMRS)¹ were launched in Canada in the early 1980s when the Department of Communications (now Industry Canada) issued licences for 40 MHz of spectrum in the Cellular band. In response to tremendous growth in demand for mobile telephony services, additional spectrum was designated for CMRS in 1989 (in the Cellular band), in 1995 (in the PCS band), and in

¹ For further details, refer to Radio Systems Policy RP-14 — *Radio Systems Policy RP-003 and RP-005 Relevant to the Level of Usage of Mobile Systems and also the Definition of a Cellular Mobile Radio Service as originally set out in October, 1982.*

2001 (auction of additional PCS spectrum). The Advanced Wireless Service (AWS) auction in 2008 made available an additional 105 MHz to the commercial mobile industry in three different bands: AWS, PCS and 1670-1675 MHz. As a result of the AWS auction, several new facilities-based wireless service providers have recently launched or announced their planned launch of wireless services.

Recent advances in wireless communication technology and electronics miniaturization enable a far richer experience for the end-users of mobile wireless services, including mobile multimedia applications. The next generation of mobile broadband networks will support higher data throughput rates, lower latencies and more consistent quality of service. This will increase the range of applications and devices that can benefit from mobile broadband connectivity, generating a corresponding increase in demand for mobile broadband service by consumers, businesses, public safety agencies, health-care facilities, education institutions, energy associations and other public sector users. Widely quoted industry reports mention an increase in demand for mobile data traffic of multiple orders of magnitude over the next 3-5 years.²

Sufficient spectrum to enable wireless network expansion and new broadband technologies will be needed to allow the continued growth of wireless broadband, leading to lower prices and improved quality of service for end-users, as well as enhanced opportunities for innovation and investment. To this end, the Department is making available spectrum in the 700 MHz band for commercial mobile systems.

The 700 MHz spectrum is attractive due to lower costs associated with system deployments, as service provisioned over lower frequencies can reach subscribers at a greater distance from the base station. In addition, by taking advantage of wide radio channels, broadband radio technologies (such as LTE) can accommodate further increases in distance between subscribers and base stations and/or increased data communication speeds. As a result, deployment of broadband radio systems in the 700 MHz band will have an important role in increasing the penetration of broadband wireless services in regions with low population density.

The Digital Dividend

In recent years, global interest for new spectrum to accommodate emerging mobile technologies has increased significantly. The demand for spectrum has spurred discussions internationally and, as a result, at the World Radio Conference in 2007 (WRC-07), the International Telecommunication Union (ITU) identified spectrum for International Mobile Telecommunications (IMT) in the band 698-862 MHz.

In many parts of the world, portions of this band are currently being used for over-the-air television broadcasting. For decades, television broadcasting has been delivered using analog technology. With the advances in digital transmission technology, television broadcasting can now be delivered more efficiently (i.e. using less spectrum), thereby freeing up spectrum that can be repurposed for other services and applications. This spectrum, also known as the *Digital Dividend*, offers an excellent balance between transmission capacity and distance coverage, and will allow new licensees in this band to offer next generation mobile broadband services, which are currently being sought by consumers. In

² Cisco, *Hyperconnectivity and the Approaching Zettabyte Era*, June, 2010.

Canada, United States, and many countries in the Americas, the frequency range above 806 MHz is already used for mobile communications. In these countries the *Digital Dividend* refers to the frequency range 698-806 MHz.

In order to fully benefit from an internationally harmonized band, including the advantages of widely available equipment and the ease of international roaming, Canada has often adopted harmonized spectrum allocations on a global and/or regional basis, especially with the United States. Over the years, harmonization with the U.S. has presented several advantages, including cross-border roaming. Harmonization with other international frequency arrangements is also often considered, while taking into account specific aspects of the Canadian market and services.

Status in Canada

In 1997, Canada adopted the Advanced Television Systems Committee (ATSC) Digital Television standard for terrestrial transmission to replace the NTSC (National Television System Committee) standard used for analog TV broadcasting in the UHF and VHF bands. In anticipation of the digital TV (DTV) transition in Canada, the Department published the first DTV Transition Allotment Plan in 1998, provisioning the introduction and operation of DTV undertakings alongside existing NTSC undertakings.

The DTV allotment plan relocates all UHF high power broadcasting undertakings into the frequency range 470-698 MHz. As a result, the frequency range 698-806 MHz, often referred to as the “700 MHz band,” will become available for other services and applications. The final Post-Transition DTV Allotment Plan was released in December 2008.

In 2007, the Canadian Radio-television and Telecommunications Commission (CRTC) established the deadline³ of August 31, 2011, to end all over-the-air analog TV broadcasting. In early 2010, the CRTC confirmed the deadline of August 31, 2011, for the transition of full-power analog transmitters operating in the 31 identified mandatory markets and for those operating on channels 52-69 outside of the mandatory markets. The broadcasters outside the mandatory markets who choose not to convert to digital must either move their service(s) to a channel outside the 52 to 69 range or must cease operation of their analog transmitter(s).

In June 2004, the Department issued the Spectrum Utilization Policy SP-746, *Mobile Service Allocation Decision and Designation of Spectrum for Public Safety in the Frequency Band 746-806 MHz*, which established the mobile service as a co-primary service with the broadcasting service in the band 746-806 MHz. SP-746 also designated the bands 764-770 MHz (TV channel 63) and 794-800 MHz (TV channel 68) for public safety. In June 2009, SP-768 MHz, *Narrowband and Wideband Public Safety Radiocommunication Systems in the Bands 768-776 MHz and 798-806 MHz*, was released, designating the bands 770-776 MHz (TV channel 64) and 800-806 MHz (TV channel 69) for public safety. Also included in SP-768 was a new band plan specifying the bands 768-776 MHz and 798-806 MHz for narrowband and wideband public safety communications, aligning the spectrum with the United States. SP-768 also indicated that the use of the spectrum designated for public safety in the bands 764-768 MHz and 794-798 MHz would be subject to a future consultation.

³ Broadcasting Public Notice CRTC 2007-53: <http://www.crtc.gc.ca/eng/archive/2007/pb2007-53.htm>

Status in the United States

In the United States, the transition from analog-to-digital TV was completed in June 2009. For the auction leading up to the transition, the 700 MHz band was considered as two distinct bands: the Upper 700 MHz Band (UHF TV Channels 60-69), which is comprised of 60 MHz, and the Lower 700 MHz Band (UHF TV Channels 52-59), which is comprised of 48 MHz. The Lower and Upper 700 MHz bands were auctioned in multiple stages between September 2002 and March 2008. It should be noted that in the Upper 700 MHz band, there is 24 MHz of spectrum designated for public safety which was not a part of the auction process. The total amount of spectrum auctioned so far by the U.S. Federal Communications Commission (FCC) in the 700 MHz band consists of 58 MHz of paired and 12 MHz of unpaired spectrum.⁴

The final auction in March 2008, entitled Auction 73, received high interest from the mobile industry. The proceeds of Auction 73 were the largest of any U.S. auction of wireless spectrum to date. The FCC had established various goals for the auctions, such as promoting open access and facilitating national public safety interoperability. To this end, it used a series of measures, including open access as a condition of licence (C Block, 746-757/776-787 MHz) and the requirement of a public safety/private partnership (D Block, 758-763/788-793 MHz) between a commercial licensee and a single public safety licensee, with the objective of developing a nationwide, shared interoperable broadband network for use by public safety users in cases of emergencies. The D Block, however, was not licensed since auction bids did not meet the reserve price. In recent months, there has been much discussion in the United States regarding the terms and conditions to license the D Block and whether it will be auctioned as initially anticipated or if it will be granted to public safety service through the Public Safety Spectrum Trust (PSST).

Since the end of the auction process, U.S. licensees in the commercial portion of the 700 MHz band have announced the launch, by the end of 2010, of broadband mobile services based on the Long-Term Evolution (LTE) technology.

Status in other regions

In September 2010, the Asia-Pacific Telecommunity (APT)⁵ announced that two harmonized frequency arrangements for IMT in the 698-806 MHz frequency band were adopted in that region. The first band plan consists of a 45 + 45 MHz block for frequency division duplex (FDD) use only (with a centre gap of 10 MHz), and the second band plan allows for time division duplex (TDD) use in the entire 698-806 MHz band.

⁴ Not including the guardband blocks A and B in the Upper 700 MHz (4 MHz).

⁵ Asia-Pacific Telecommunity website: <http://www.aptsec.org/>

Other Consultations

As noted above, the Department is committed to ensuring that Canadian consumers, businesses and public institutions continue to benefit from the availability of new and advanced telecommunications services in all regions of the country. Such services directly impact the adoption and use of digital technologies and, more generally, the competitiveness and productivity of the Canadian economy. These objectives are also found in other consultations that the Department has initiated.

In May 2010, the Government of Canada launched an online public consultation entitled *Improving Canada's Digital Advantage – Strategies for Sustainable Prosperity*, aimed at creating a digital economy strategy for Canada. Comments received through this consultation process are available on Industry Canada's website at <http://de-en.gc.ca/en/home/>.

Also, public consultation on foreign investment restrictions in the telecommunications sector entitled *Opening Canada's Doors to Foreign Investment in Telecommunications: Options for Reform* was launched in June 2010. Submissions were accepted until July 30, 2010, and are available for viewing on the Department's website at <http://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf09919.html>.

A consultation process is currently under way towards the repurposing of the 2500 MHz band to allow flexible use, including mobile broadband services. The document, *Decisions on the Transition to the Broadband Radio Service (BRS) in the Band 2500-2690 MHz and Consultation on Changes Related to the Band Plan*, and comments received from respondents are available on Industry Canada's departmental website at <http://www.ic.gc.ca/spectrum>.

The results of these consultations and the related decisions will be taken into consideration as part of this consultation.

4. Commercial Mobile Services

4.1 Overview of the Canadian Mobile Market

The wireless sector plays an increasingly important role in Canada's overall telecommunications industry. In Canada, as in other countries, consumers are increasingly using mobile broadband services to access the Internet, demanding the latest devices and applications. Canada already has good coverage of wireless networks, with 99% of Canadians having access to wireless services, and 96% able to access advanced wireless networks that support smartphones, wireless tablets and wireless USB modems. As technology continues to advance, notably with the introduction of next generation services and enhanced mobile video, Canadian industry will face continued pressure to upgrade networks and services.

The importance of wireless is demonstrated by the relative growth compared to traditional services.⁶ While the annual growth in revenue in the wireline segment has remained relatively constant for the last five years, averaging just 0.7%, growth in the wireless segment has averaged 11.4% in the same period. In 2009, wireless revenues increased 5.4% to \$16.8 billion, while wireline revenues declined slightly, from \$24.2 billion to \$24.1 billion. This growth in wireless can also be seen in the changes to the

⁶ All statistics are taken from the 2010 CRTC Communications Monitoring Report.

subscriber base. There were 23.8 million residential and business wireless subscribers in 2009, a 7.8% increase over the 2008 level of 22.1 million.

The Canadian market has primarily been served by three large facilities-based providers, Rogers Communications, which had 39% of the wireless revenues in 2009, followed by TELUS Communications Company (28%), the Bell Group⁷ (28%), and other providers, principally MTS Allstream and SaskTel. In terms of subscribers, of the total, Rogers had 37%, the Bell Group 30%, and TELUS 28%. In the past year, four new service providers have begun to offer mobile service using spectrum acquired as part of the AWS auction in 2008. Wind Mobile launched in December 2009, while Mobilicity, Public Mobile and Videotron commenced operations in 2010. Two more providers, Shaw and Bragg Communications Inc. are also expected to launch service in the near future. Data is not yet available on the impact of new entrants on the market and on their respective market shares.

4.2 Stakeholder Holdings, Demand and Business Considerations

The development of innovative devices and applications and the corresponding adoption by consumers are driving spectrum demand and the need for increased investment in broadband networks. Industry developments reveal a continuing trend of increased use of bandwidth-intensive mobile broadband services and applications.

Spectrum Holdings

Some of the bands currently available for commercial mobile service are listed below.

- Cellular: 824-849 MHz/869-894 MHz (50 MHz)
- 1670-1675 MHz (5 MHz)
- Advanced Wireless Services (AWS): 1710-1755 MHz/2110-2155 MHz (Total 90 MHz)
- Personal Communication Systems (PCS): 1850-1915 MHz/1930-1995 MHz (Total 130 MHz)
- Broadband Radio Services (BRS): 2500-2690 MHz (190 MHz)

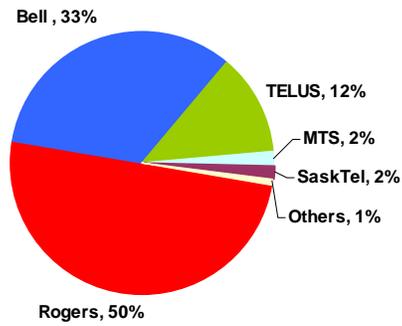
The following charts serve to demonstrate the distribution of major holdings for commercial mobile spectrum in the Cellular, PCS and AWS bands. In order to simplify this illustration, holdings are presented based on Tier 2 service areas. The percentage of total holdings represents spectrum assigned to each entity⁸ in Canada and is regionally weighted by population of the assigned service areas, where applicable. It should be noted that TELUS provides business-oriented mobile telephone and data services based on iDEN technology in the 806-821/ 851-869 MHz band. This service is based on site specific radio licensing and is not included in the charts in the following pages. The 1670-1675 MHz band is also not represented in the charts below.

⁷ The CRTC defines Bell Group of companies as: Bell Canada Inc., Northwestel Mobility Inc., Bell Mobility Inc., Télébec, NorthernTel Limited Partnership, Skyterra (Canada) Inc., Virgin Mobile Canada and Latitude Wireless Inc.

⁸ For the purpose of the illustrations in this section, Bell includes: Bell Mobility, Bell Alliant, Northwestel Mobility, Northern Tel Ltd Partnership and Latitude Wireless Inc.

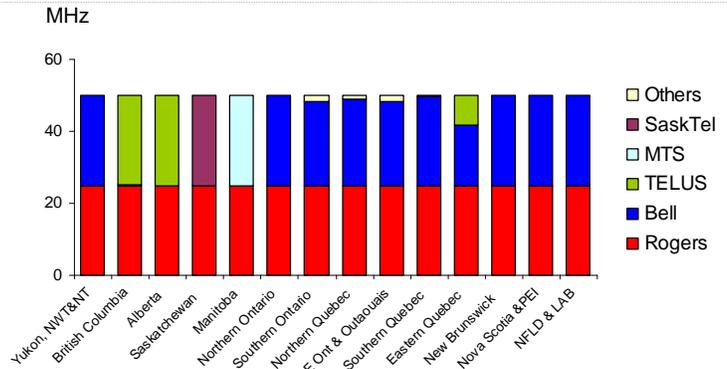
Figure 4.1 – Cellular Holdings (50 MHz : 824-849 MHz/869-894 MHz)

(a) Percentage of Total Holdings
(weighted by population)



(Representing 100 % of the total spectrum available in the band)

(b) Total Holdings by MHz, by Service Area⁹



Note: "Others" includes members of the Canadian Alliance of Publicly-owned Telecommunications Systems (CAPTS), the Ontario Telecommunication Association (OTA), and the Association des compagnies de téléphone du Québec (ACTQ) and other small licensees.

⁹ Weighted by population if the Service Area is divided between multiple service providers.

Figure 4.2 – PCS Holdings (130 MHz : 1850-1915 MHz, 1930-1995 MHz)

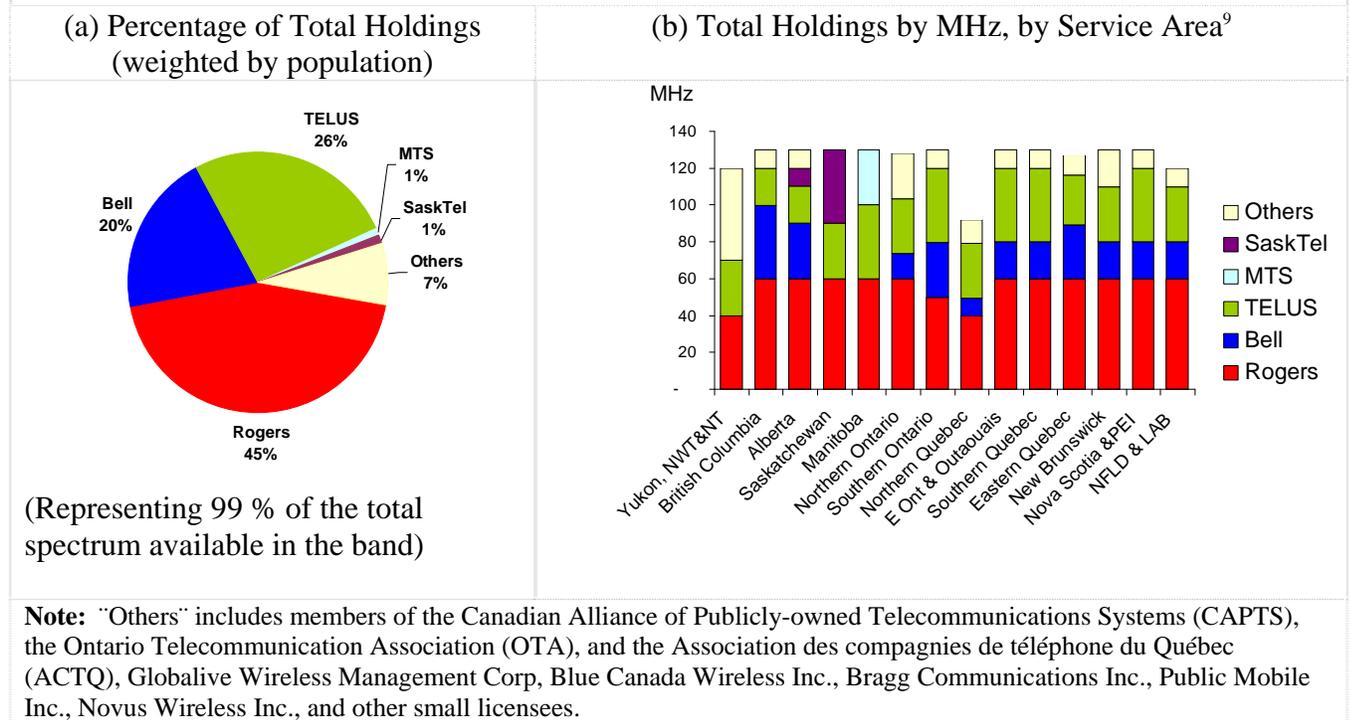
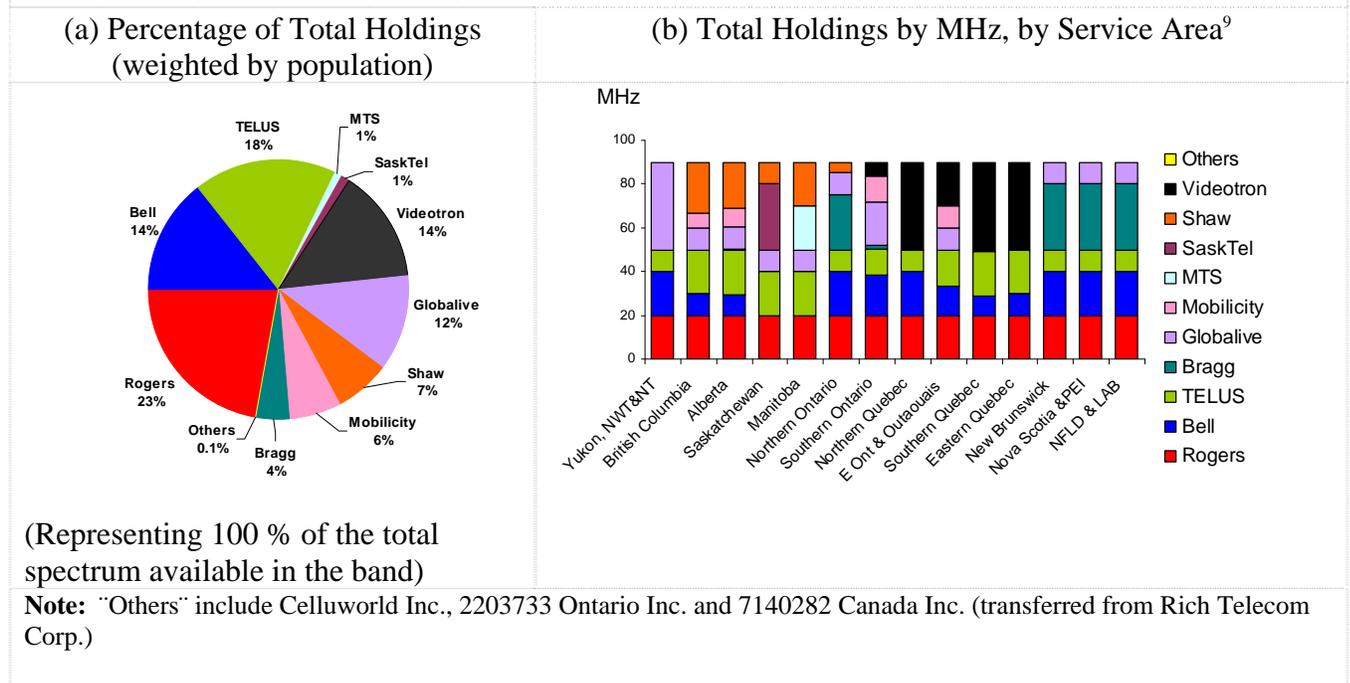
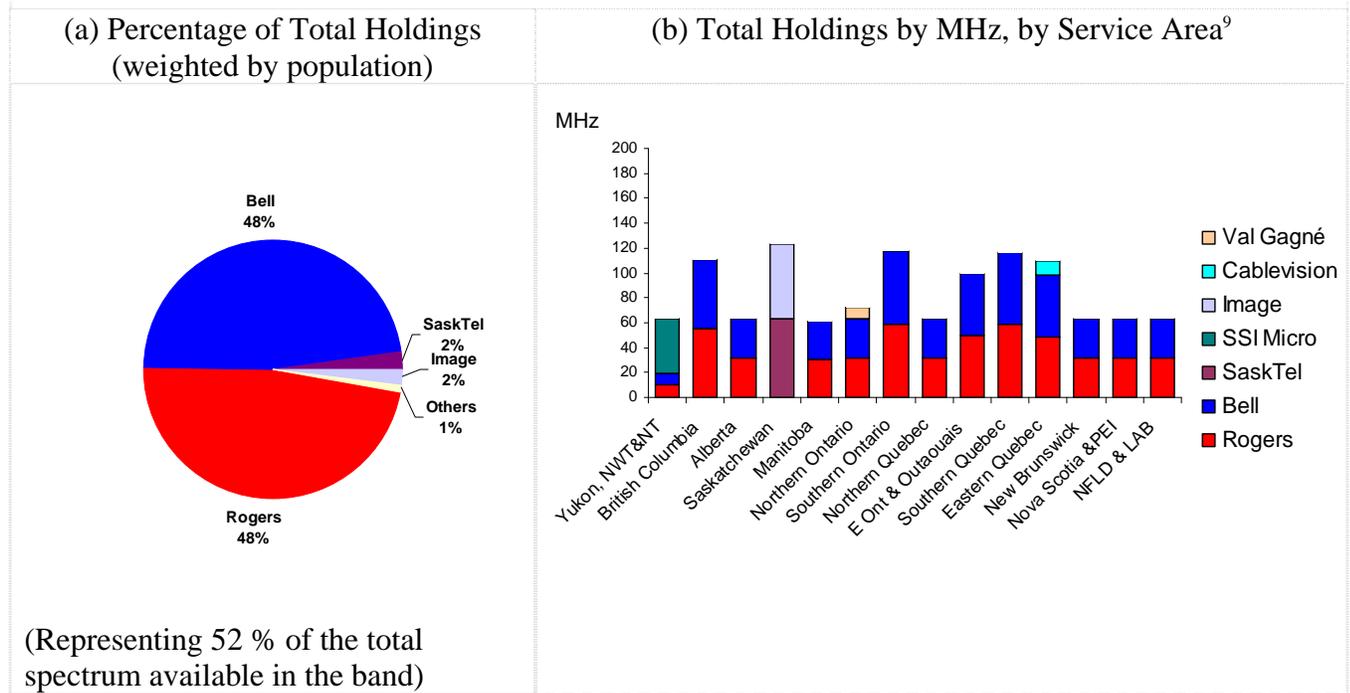


Figure 4.3 – AWS Holdings (90 MHz : 1710-1755 MHz and 2110-2155 MHz)



⁹ Weighted by population if the Service Area is divided between multiple service providers.

Figure 4.4 – BRS Holdings (190 MHz : 2500-2690 MHz)



(Representing 52 % of the total spectrum available in the band)

Note: Holdings by Bell and Rogers demonstrate joint holdings under Inukshuk Internet Inc. Others include Cablevision TRP-SDM Inc., Val Gagné Communications Association and SSI Micro. Holdings assume full conversion of existing MCS and MDS authorizations.

Figure 4.5 – Summary of Holdings for Cellular, PCS, AWS and BRS spectrum

Percentage of Total Holdings (weighted by population)

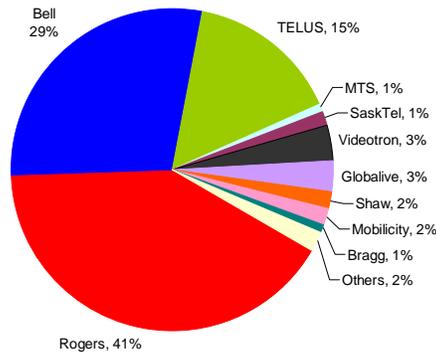
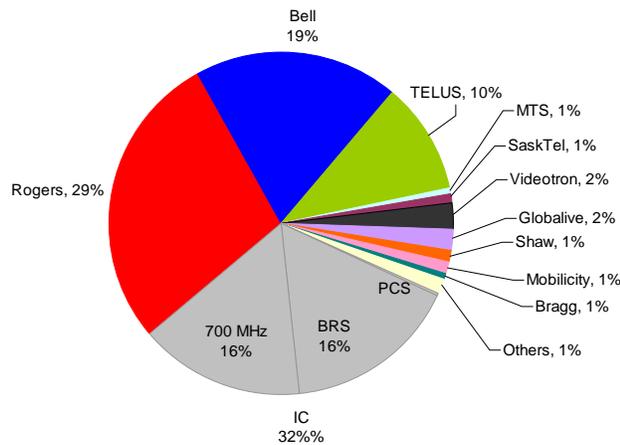


Figure 4.6 – Summary of Holdings and Available Cellular, PCS, AWS, BRS and 700 MHz spectrum (Total 544 MHz)

Percentage of Total Holdings (weighted by population)



Note: 700 MHz band is based on a maximum of 84 MHz of spectrum available.

In 2008, 90 MHz of AWS spectrum was offered through auction with specific blocks of spectrum set-aside explicitly for eligible bidders. As a result, 45% of the total 90 MHz of AWS spectrum was licensed to eligible new entrants, while the three largest wireless service providers, Rogers, Bell Mobility Inc. and TELUS (TCC) hold approximately 55% of the spectrum (weighted by population).

More detailed information on specific service providers' spectrum holdings in regard to these bands is available on the Spectrum Direct website at <http://www.ic.gc.ca/eic/site/sd-sd.nsf/eng/home>.

As a result of the AWS auction, several companies have recently launched service in the wireless market sector as new facilities-based wireless service providers or have announced plans to do so. This new entry, mainly in large metropolitan centres, along with the reactions by established wireless service providers to it, appears to have spurred competition in terms of service offerings, pricing plans and product differentiation. These changes appear to have improved the accessibility and affordability of wireless services to certain consumer segments.

Drivers for spectrum demand

Globally, the popularity of accessing the Internet by wireless devices at broadband speeds continues to grow. Computer laptops, notebooks and netbooks can access mobile Internet service by means of a USB wireless modem, wireless module, or data card. Mobile handsets, especially the new generation of smartphones, are the predominant devices, using mobile broadband data services.¹⁰ Referencing Strategy Analytics February 2010 as its source, the CRTC reported that a record 54 million smartphones (of a global total of 337 million mobile phones) were sold worldwide in the fourth quarter of 2009, representing a growth of 32% over the same period in 2008 (compared to 15% growth in the overall number of mobile handsets shipped worldwide in 2009).

The U.S. National Broadband Plan released in 2010 notes that mobile broadband represents the convergence of two disruptive technologies – Internet computing and mobile communications – and may be more transformative than either of these previous breakthroughs.¹¹ In response to the explosive growth predicted in wireless broadband usage, carriers must offer more services to more consumers, thus creating an increased demand for spectrum, such as the 700 MHz band.

Consistent with this expectation that demand for the 700 MHz spectrum will exceed supply, the Department will make the 700 MHz spectrum available through an auction, as opposed to a first come, first served (FCFS) process, which is still used where Industry Canada believes that the spectrum supply is adequate to meet demand or where a reasonable accommodation of all applications can be managed.

4-1. What is the general need for additional commercial mobile spectrum at this time and what do you anticipate the future needs to be?

¹⁰ CRTC Monitoring Report 2010

¹¹ National Broadband Plan - Connecting America, 2010: <http://www.broadband.gov/plan/>

It should be noted that alternate spectrum access arrangements (other than a competitive licensing process) could also be used to meet anticipated demand, for example, the use of licence-exempt spectrum, the trading/leasing of spectrum licences, or the use of Radio Systems Policy RP-019, *Policy for the Provision of Cellular Services by New Parties*, etc.

In the case where no additional spectrum is available, licensees typically employ spectrally efficient technologies and deployment methods, which, to the extent possible, could increase the ratio of available capacity to the amount of spectrum utilized.

The Department is seeking specific spectrum usage information from current commercial mobile licensees and entities interested to acquire commercial mobile spectrum:

4-2. Provide general deployment information on the current use of your existing holdings in each mobile spectrum band. In the case where current holdings are not being used, provide information on its planned use, including timelines.

4-3. Indicate your need for additional spectrum for commercial mobile service applications and how much spectrum is required.

(a) What deployment timelines are being considered?

(b) What types of applications/uses are envisioned?

(c) To what degree will your business' anticipated spectrum needs be addressed by having access to the 700 MHz and/or 2500 MHz spectrum?

4-4. Do you plan to use 700 MHz spectrum acquired in the auction with, or on behalf of, another entity, which may participate in the auction? If yes, with which entity?

4-5. Provide comments on the extent to which alternate spectrum access arrangements have been investigated/considered to respond to your need for additional spectrum. In addition, provide specific efficiency measures investigated or implemented for current holdings.

Your comments to the above questions will be considered proprietary and will remain confidential. Responses to these questions must be submitted separately (e.g., in an appendix) and clearly marked as "Confidential."

5. 700 MHz Band Plan Issues and Considerations

5.1 700 MHz Band Plan Architecture for Commercial Mobile Systems

Recent advances in wireless communication technology and electronics miniaturization have provided a richer experience for consumers of advanced broadband wireless services, leading to increased demand for such services and resulting in a significant increase in the use of bandwidth-intensive multimedia applications. In order to provide maximum benefits to consumers of broadband wireless services and to support the growth in bandwidth demand, the architecture of the 700 MHz band will be assessed in view of the following criteria, in no particular order:

- promoting efficient use of the limited radio spectrum by maximizing capacity in the 700 MHz band;
- harmonization of equipment specifications to the extent possible, enabling economies of scale and greater equipment availability for consumer and infrastructure equipment;
- deployment of infrastructure with reduced capital and operational costs, enabling affordable services to consumers;
- international roaming;
- cross-border frequency coordination;
- impact on competition and investment when packaging the available spectrum for auction.

Although a maximum of 84 MHz of spectrum is available in the 700 MHz band for commercial mobile services (taking into account the current 24 MHz designated for public safety), there are several technical considerations, such as guardbands, which may limit the amount of spectrum to be auctioned. Mobile broadband systems require larger frequency blocks, which would reduce the number of blocks available for auction.

Considering the current deployments in the United States and the band plan structures adopted by the Asia-Pacific Telecommunity (APT), there are currently two main international band plans, technical rules and utilization options which may, with certain adaptations, be implemented in Canada.

In considering the band plan architecture to be implemented in Canada, the Department is proposing four options for consideration:

- **Option 1:** Harmonize with the U.S. band plan;
- **Option 2a:** U.S. band plan with slight adjustments – with 8 and 10 MHz channel blocks in the Lower 700 MHz;
- **Option 2b:** U.S. band plan with slight adjustments – with a mix of 3 and 5 MHz channel blocks in the Lower 700 MHz;
- **Option 3:** Harmonize with the APT band plan.

These band plans, technical rules and utilization options are discussed below.

Option 1: Harmonize with the U.S. band plan

In the United States, the reclamation of television spectrum above TV channel 51 was addressed in two proceedings: the Upper 700 MHz Band (TV channels 60-69), which comprises 60 MHz, and the Lower 700 MHz Band (TV channels 52-59), which comprises 48 MHz.

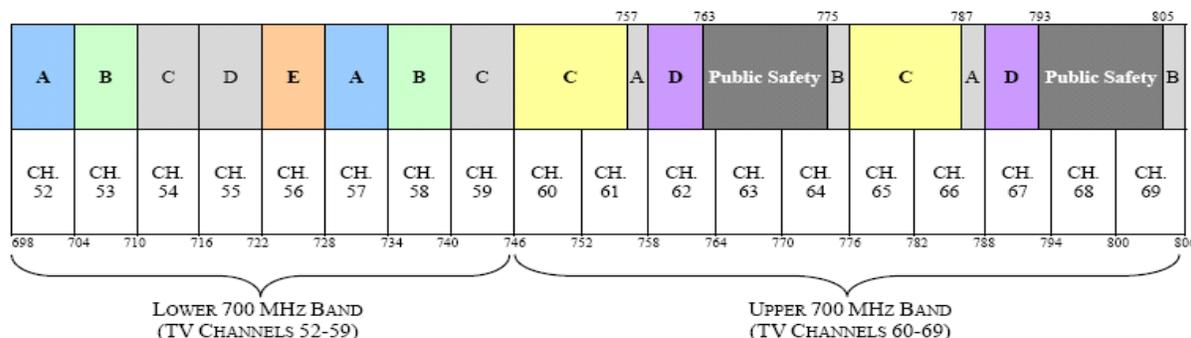
The Lower and Upper 700 MHz bands were auctioned in multiple stages between September 2002 and March 2008.¹² U.S. licensees have begun trial networks and plan to launch commercial services in approximately 30 markets by the end of 2010, with a nationwide service by the end of 2013.¹³

¹² Auction 44: Lower 700 MHz band (2002): http://wireless.fcc.gov/auctions/default.htm?job=auction_summary&id=44
Auction 49: Lower 700 MHz band (2003): http://wireless.fcc.gov/auctions/default.htm?job=auction_summary&id=49
Auction 73: 700 MHz band (2008): http://wireless.fcc.gov/auctions/default.htm?job=auction_summary&id=73

¹³ GSA Digital Dividend Update - April 2010: <http://www.gsacom.com>

The U.S. band plan is shown in Figure 5.1 below. As depicted in the figure, the U.S. band plan is generally based on a 6 MHz channel grid, and includes both paired and unpaired blocks.

Figure 5.1 - U.S. Band plan for the 700 MHz band¹⁴



Block	Frequencies (MHz)	Bandwidth	Pairing	Area Type	Licenses
A	698-704, 728-734	12 MHz	2 x 6 MHz	EA	176
B	704-710, 734-740	12 MHz	2 x 6 MHz	CMA	734
C	710-716, 740-746	12 MHz	2 x 6 MHz	CMA	734
D	716-722	6 MHz	unpaired	EAG	6
E	722-728	6 MHz	unpaired	EA	176
C	746-757, 776-787	22 MHz	2 x 11 MHz	REAG	12
A	757-758, 787-788	2 MHz	2 x 1 MHz	MEA	52
D	758-763, 788-793	10 MHz	2 x 5 MHz	Nationwide	1 *
B	775-776, 805-806	2 MHz	2 x 1 MHz	MEA	52

* Subject to conditions respecting a public/private partnership.

Note 1: The highlighted text in the table identifies frequency blocks auctioned prior to Auction 73 in 2008.

Table 5.1: Licences available in the Option 1

Commercial Spectrum		Public Safety	Guardbands
Paired	Unpaired	Broadband	
3 licences @ 6 + 6 MHz (each)*	2 licences @ 6 MHz	5 + 5/10 + 10 MHz ¹⁵	2 licences @ 1+1 MHz (each)
1 licence @ 11 + 11 MHz*		Narrowband	
1/0 ¹⁵ licence @ 5 + 5 MHz		8+8 MHz	
TOTAL: 68/58 MHz*	TOTAL: 12 MHz	TOTAL: 26/36 MHz	TOTAL: 4 MHz
TOTAL SPECTRUM: 108 MHz			

*Equipment currently available in this band uses 5MHz and 10 MHz channel bandwidths. Therefore, 5 MHz in each 6 MHz block and 10 MHz in each 11 MHz block will be used. As a result, 8 MHz of the total paired spectrum (as indicated in the table) would not be effectively used. Consequently, the total usable paired spectrum, by equipment using 5/10 MHz channels bandwidths, would be 60/50 MHz.

¹⁴ Reproduced from the FCC website: <http://wireless.fcc.gov/auctions/data/bandplans/700MHzBandPlan.pdf>

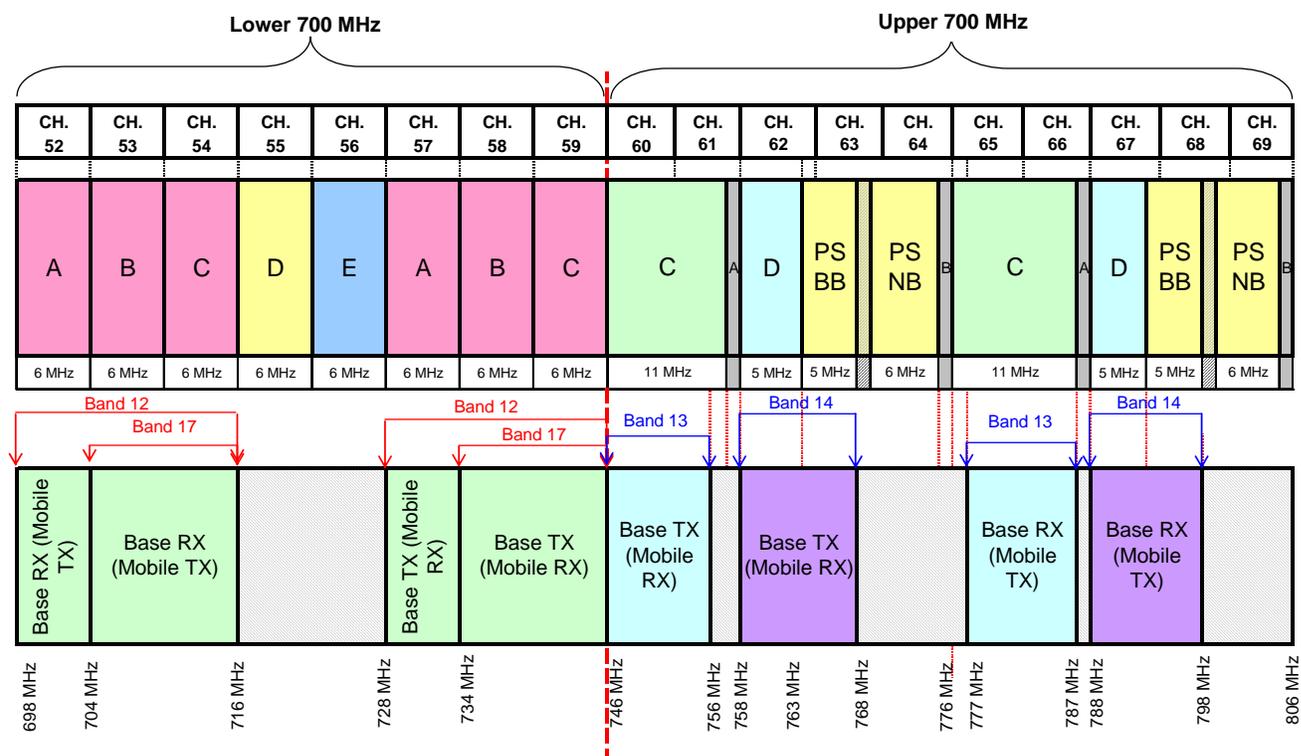
¹⁵ Pending the decision on spectrum use for broadband public safety (see Section 5.2).

FCC technical rules for this band¹⁶ mandate the use of FDD mode of operation for the blocks in the Upper 700 MHz (746-806 MHz), with the base station transmission in the 746-763 MHz range, in order to ensure electromagnetic compatibility with the public safety systems operating in the frequency range 763-775/793-805 MHz.

On the other hand, for the Lower 700 MHz band (698-746 MHz), the FCC’s approach in setting technical rules for the U.S. band plan was to rely on the industry to adopt methods for the deployment of radio systems. The duplexing mode of operation (FDD, TDD or unidirectional) is not prescribed for either paired or unpaired blocks. Guardbands are not provisioned between the paired and unpaired portions of the band. Furthermore, the FCC technical rules explicitly state that no protection from interference between stations in adjacent frequency blocks or geographic areas is afforded. Therefore, interference issues are expected to be resolved by the licensees.

Since the auction and licensing of the 700 MHz spectrum, U.S. operators in the band have announced and/or have started deploying systems based on the 3rd Generation Partnership Project (3GPP)¹⁷ and proprietary standards as depicted in Figure 5.2.

Figure 5.2: Comparison of U.S. band plan and 3GPP technical specifications for equipment



¹⁶ Duplexing direction for guardbands A and B (757-758 MHz/787-788 MHz and 775-776 MHz/ 805-806 MHz respectively) are specified as per FCC Title 47, Part 27, subsection 27.50 and public safety blocks are specified in FCC Title 47, Part 90, Subsection 90.531.

¹⁷ 3GPP TS 36.104 v9.4.0 (2010-06): 3GPP Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Base Station (BS) radio transmission and reception (Release 9).

3GPP requirements for bands 12, 13, 14 and 17 mandate that the user equipment support 1.4, 3, 5 and 10 MHz channel bandwidths. Present and planned deployments in the United States are based on 5 and 10 MHz channel equipment.

In the Lower 700 MHz unpaired blocks D and E (716-728 MHz), unidirectional mobile systems based on a proprietary standard (MediaFLO™) were deployed. There is no 3GPP standard defined for this frequency range.

The problem of potential self-interference caused by user equipment operating in the D Block (758-763/ 788-793 MHz) to Global Positioning System (GPS) receivers in the same device was evaluated by the industry. The GPS operates on a centre frequency of 1575.42 MHz and has an operating bandwidth of 2 MHz. This interference arises when a user device transmits energy in the 787.21 MHz to 788.21 MHz range, which may generate a second harmonic that falls within the GPS receiver passband.

As noted from Figure 5.2 above, the frequency range 787.21-788.27 MHz lies predominantly within the guardband and partially into the uplink¹⁸ of the D Block in the Upper 700 MHz. Current equipment specifications set by the 3GPP for out-of-band emissions ensure that relatively low energy levels at the D Block band edge will be emitted, thus minimizing potential interference to the internal GPS receiver. As a result, potential self-interference is not expected to hinder the GPS function of commercial equipment.

Adopting Option 1 would promote economies of scale by allowing the Canadian market access to a wide selection of low-cost equipment. It would enable cross-border roaming and allow simpler cross-border frequency arrangement and coordination procedures.

Although the U.S. band plan is suitable for the American market, it presents a few challenges which may impact the Canadian industry. In the United States, portions of the Lower 700 MHz band have been auctioned while broadcasting undertakings using 6 MHz channel widths were still in operation in other parts of the band. As a result, the Lower 700 MHz band (and, to some extent, the Upper 700 MHz band) was structured around a 6 MHz channel grid. Although the 6 MHz channel grid ensured compatibility with the previous broadcasting use of the band, the new broadband mobile technologies being deployed in this band are based on 5 MHz channel widths. Noting that the deployment of mobile broadband systems in Canada will take place only after the completion of the DTV transition in this frequency range, the 6 MHz channels present a challenge from the perspective of effective spectrum utilization. Over the entire 700 MHz band, as much as 12 MHz of spectrum would not be used effectively by new broadband technologies.

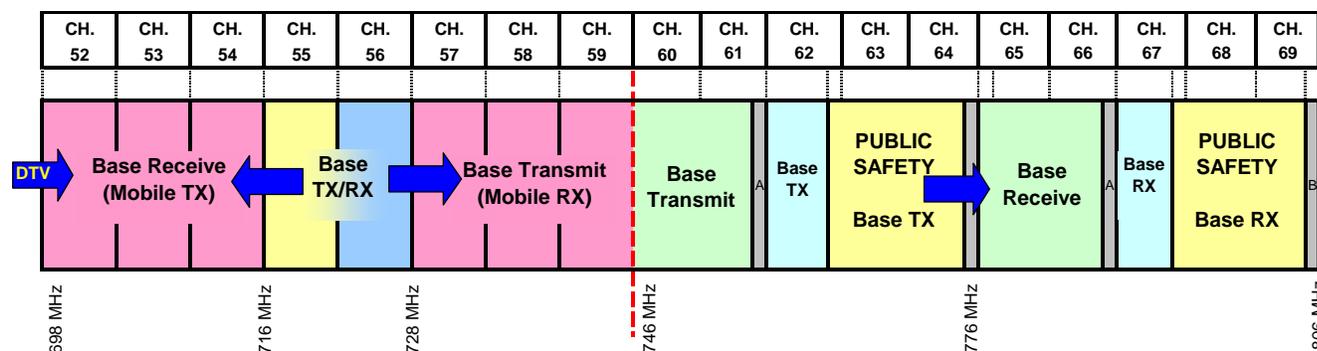
Should the U.S. band plan as described above be adopted in Canada, deployments may be affected by potential interference issues that have been identified between adjacent services, as depicted in following figure:

1. Lower 700 MHz band base receivers complying with 3GPP Band 12 requirements may potentially be subject to interference from high power DTV transmissions in the adjacent DTV channel 51.

¹⁸ The duplexing direction of the D Block must be compatible with the duplexing directions for public safety systems in adjacent blocks.

2. As no guardbands are provided between the paired and unpaired operations in the Lower 700 MHz band, mutual harmful interference is possible between services adjacent to either the 716 or 728 MHz frequencies.
3. There is potential risk of overload interference to broadband base receivers operating above 776 MHz from high power public safety narrowband transmissions immediately below 775 MHz.

Figure 5.3: Potential interference issues between adjacent services



Options 2a and 2b: U.S. band plan with slight adjustments

Two band plan options are proposed based on the U.S. band plan, using the same transmit (TX) and receive (RX) radio frequency ranges as implemented in United States. However, a few modifications are proposed for the channelling plan in the Lower 700 MHz with a view to making more efficient use of the available spectrum. In this way, compared with Option 1, the channel plan for both options 2a and 2b (as described below) could enable a more effective use of 6 MHz of spectrum.

The Option 2a band plan is intended to structure the available 700 MHz spectrum to enable the use of 10 + 10 MHz channels as much as possible.

As widely reported in literature and indicated by the industry in other consultation processes, broadband radio channels of wider bandwidth (for example, 10 MHz vs. two 5 MHz channels) provide clear technical benefits, facilitating and enabling deployments of mobile broadband systems by offering:

- higher per hertz spectral efficiency, enabling the provision of high capacity services in urban areas with fewer base stations;
- extended reach, enabling the provision of target broadband speeds in rural areas while using fewer towers and improving in-building penetration in urban areas;
- reduced carbon footprint, as well as capital and operational costs (less equipment to manufacture and install, and reduced energy consumption); and
- reduced real estate requirements (antenna space on towers and rack space in equipment shelters).

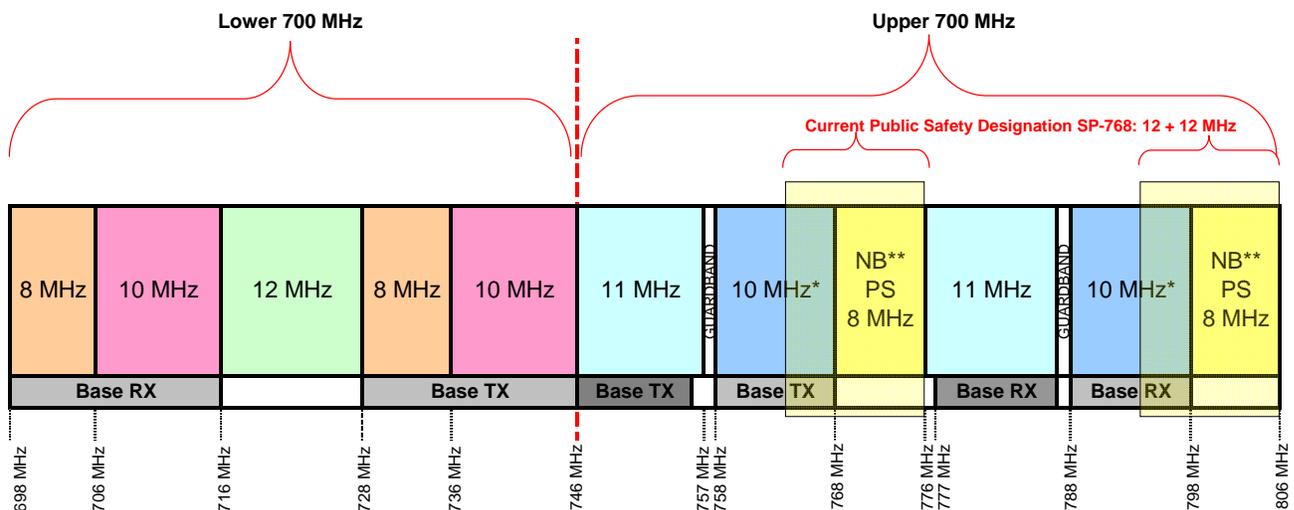
The total amount of spectrum in the 700 MHz band is limited. A band architecture based on 10 MHz increments will result in a limited number of spectrum blocks available for auction; in this case, for example, a maximum of four blocks of paired spectrum would be available.

The Option 2b band plan is mostly structured in units of 5 + 5 MHz where possible. Recognizing that wider channels provide technical advantages, auctioning the spectrum in units of 5 + 5 MHz may provide flexibility by relying on market forces to aggregate 5 MHz blocks to form contiguous larger blocks. As well, this would double the number of blocks available for auction. However, auctioning the spectrum in 5 + 5 MHz blocks may increase the risks for bidders wishing to acquire contiguous larger blocks, resulting in band fragmentation and possibly hindering the deployment of more advanced broadband systems.

Option 2a

The band plan shown in Figure 5.4 is proposed as Option 2a for the 700 MHz band plan. To take advantage of equipment availability and economies of scale, the proposed band plan uses the same transmit (TX) and receive (RX) radio frequency ranges as implemented in United States. However, a few modifications are proposed for the channelling plan with a view to making more efficient use of the available spectrum.

Figure 5.4: Option 2a band plan architecture



* Use of this range is subject to the pending decision on spectrum use for broadband public safety (see Section 5.2).

** This range is designated for Narrowband Public Safety, and is not subject to this consultation.

Table 5.2 - Licences available in the Option 2a band plan

Commercial Spectrum		Public Safety	Guardbands
Paired	Unpaired	Broadband	
1 licences @ 10 + 10 MHz (each)	1 licence @ 12 MHz	0 / 5 + 5/10 + 10 MHz ¹⁹	2 MHz
1 licence @ 8 + 8 MHz		Narrowband	
1 licence @ 11 + 11 MHz*		8 + 8 MHz	
1 licence @ 10 + 10/5+5/0 MHz ¹⁹			
TOTAL: 78/68/58 MHz	TOTAL: 12 MHz	TOTAL: 16/26/36 MHz	TOTAL: 2MHz
TOTAL SPECTRUM: 108 MHz			

* Equipment currently available in this band uses 5 MHz and 10 MHz channel bandwidths, therefore, 10 MHz in each 11 MHz block will be used. As a result, 2 MHz of the total paired spectrum (as indicated in the table), would not be effectively used. Consequently, the total useable paired spectrum, by equipment using 5/10 MHz channels bandwidths, would be 76/66/56 MHz.

As can be seen in the above figure, duplexing directions are specified for the paired blocks. To minimize the possibility of interference between systems in paired and unpaired spectrum allocations, technical rules may be imposed such that operations in the unpaired spectrum will not interfere with systems in the paired blocks. These rules may result in significant usage restrictions for operations in the 12 MHz unpaired block.

In the Lower 700 MHz band, the 8 + 8 MHz block would enable deployments of equipment compliant with 3GPP band 12, as depicted in Figure 5.2. The duplexing directions follow the 3GPP specifications. A 3 MHz radio channel and a 5 MHz radio channel (both supported by the 3GPP standard) can fit within the 8 MHz block. In specific geographic areas where interference from DTV channel 51 may occur, a portion of the 3 MHz channel may be used as a guardband. For instance, a 1.4 MHz plus a 5 MHz radio channel combination (also supported by 3GPP standards) could be employed, providing the possibility for a guardband implementation between DTV channel 51 and the commercial deployment.

The 10 + 10 MHz block would enable deployments of equipment compliant with 3GPP bands 12 and 17, using either 5 MHz or 10 MHz channels.

In the Upper 700 MHz band, one 11 + 11 MHz block and one 10 + 10 MHz block are proposed, in line with 3GPP bands 13 and 14 respectively, noting that the 11 MHz paired block effectively accommodates only a 10 + 10 MHz channel.

It should be noted that, pending a decision regarding the use of commercial mobile broadband systems by public safety agencies (see Section 5.2), the amount of spectrum available for the commercial auction in the range 758-768/788-798 MHz could be 0 MHz, 5 + 5 MHz, or 10 + 10 MHz, with the balance being designated to private systems for public safety applications.

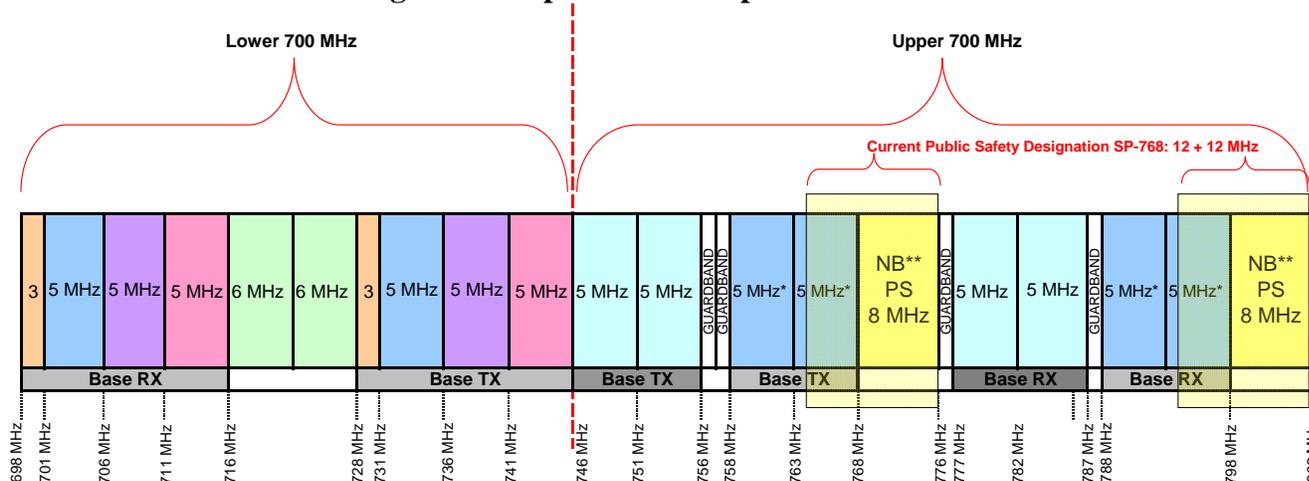
Because the spectrum blocks would not fully overlap in frequency with the U.S. auctioned blocks, the frequency coordination process may not be as simple as with Option 1 for the Lower 700 MHz band. There would be no impact to cross-border roaming between Canada and the United States.

¹⁹ Pending the decision on spectrum use for broadband public safety (see Section 5.2).

Option 2b

The band plan shown in Figure 5.5 is proposed as Option 2b for the 700 MHz band plan. The Option 2b band plan is, from the point of view of TX/ RX filtering, similar to Option 2a band plan. However, the band plan is mostly structured in units of 5 + 5 MHz where possible.

Figure 5.5: Option 2b band plan architecture



- * Use of this range is subject to the pending decision on spectrum use for broadband public safety (see Section 5.2).
- ** This range is designated for narrowband public safety, and is not subject to this consultation.

Table 5.3 - Licences available in the Option 2b band plan

Commercial Spectrum		Public Safety	Guardbands
Paired	Unpaired	Broadband	
7/6/5 ²⁰ licences @ 5 + 5 MHz (each)	2 licence @ 6 + 6 MHz	0/5 + 5/10 + 10 MHz ²⁰	4 MHz
1 licence @ 3 + 3 MHz		Narrowband	
		8 + 8 MHz	
TOTAL: 76/ 66/ 56 MHz	TOTAL: 12 MHz	TOTAL: 16/26/36 MHz	TOTAL: 4 MHz
TOTAL SPECTRUM: 108 MHz			

As can be seen from the above figure, duplexing directions are specified for the paired blocks. To avoid the possibility of interference between systems in paired and unpaired spectrum allocations, technical rules may be imposed such that operations in the unpaired spectrum will not interfere with systems in the paired blocks. These rules may result in significant usage restrictions for operations in the unpaired blocks (2 X 6 MHz).

As with Option 2a, it should be noted that, pending a decision regarding the use of commercial mobile broadband spectrum by public safety agencies (see Section 5.2), the amount of spectrum available for the commercial auction (in the range 758-768/788-798 MHz) could be 0, one block of 5 + 5 MHz (exactly as per the U.S. D Block), or two blocks of 5 + 5 MHz, with the balance being designated to private systems for public safety applications.

²⁰ Pending the decision on spectrum use for broadband public safety (see Section 5.2).

Because the spectrum blocks would not fully overlap in frequency with U.S. auctioned blocks, the frequency coordination process may not be as simple as with Option 1. There would be no impact on cross-border roaming between Canada and the United States.

Option 3: Harmonize with the FDD APT band plan

In September 2010, the APT, serving member countries in the Asia Pacific Region (including Australia, the People’s Republic of China, New Zealand, Japan and the Republic of Korea), announced the adoption of two band plan arrangements for IMT for the 698-806 MHz range. The APT band plan for FDD operations is shown in Figure 5.6 below.

Figure 5.6: APT band plan for FDD operations in the 698-806 MHz range

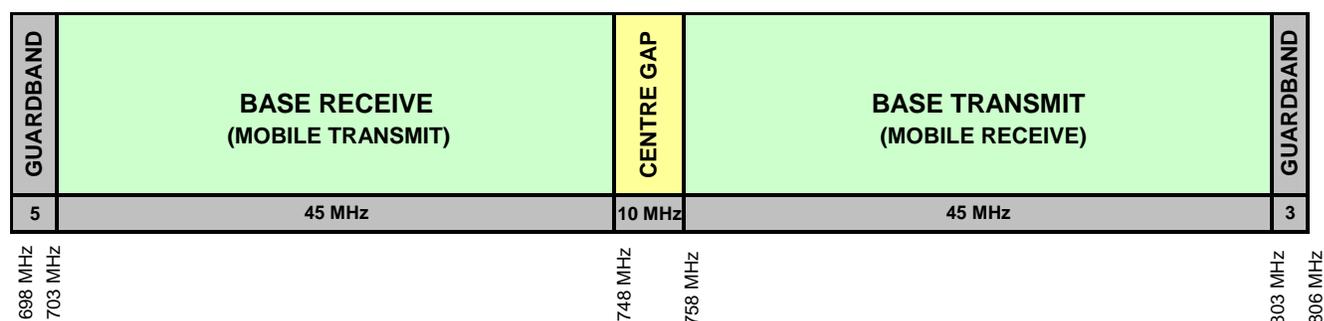


Table 5.4 - Licences available in the APT band plan

Commercial Spectrum		Public Safety	Guardbands
Paired	Unpaired	Broadband and Narrowband	
number of licences to be determined (dependent on equipment specifications for channel bandwidths)	0 MHz	the amount of spectrum is to be determined (possible public safety provision to be made)	5 + 3 MHz 10 MHz (centre gap)
TOTAL: 90 MHz	TOTAL: 0 MHz	TOTAL: to be determined	TOTAL: 18 MHz
TOTAL SPECTRUM: 108 MHz			

The above APT band plan maximizes the available contiguous spectrum in the 700 MHz band given that there is a total of 90 MHz of paired spectrum available to be licensed. The APT band plan offers additional flexibility in terms of block sizes, as 5, 10, 15 and 20 MHz block sizes could be possibly implemented. The adoption of this band plan in Canada would allow the Canadian market to take advantage of a larger wireless ecosystem. Moreover, uniform equipment specifications will be required for the entire band, thereby allowing compatibility for all blocks in this band plan. This will enable economies of scale and flexibility for consumers.

The adoption of this band plan will affect the public safety spectrum. If the APT band plan were adopted, provisions for public safety spectrum (narrowband and possibly broadband) could be made by modifying SP-746 and SP-768. Furthermore, the current narrowband public safety deployments would need to be reallocated to other parts of the 700 MHz band within the context of the APT band plan. This option would cause interoperability and equipment compatibility issues between Canada and the

United States for both commercial and public safety services, and availability of equipment for public safety systems (both narrowband and broadband) may be limited. As well, interference and frequency coordination issues may affect deployments in the proximity of the Canada-United States border. In this case, cross-border roaming between Canada and US would be impacted.

Although there are no equipment specifications to accommodate the APT band plan, standards organizations, such as the 3GPP, will develop equipment specifications and the associated channel bandwidths which the equipment must support. Due to the large size of the market in the APT countries, it is expected that equipment will be manufactured for this band plan to meet the above frequency arrangement.

Guardbands

All the band architectures presented in the options above will require some amount of spectrum to be set aside as guardbands, as shown in figures 5.1, 5.4, 5.5 and 5.6. This spectrum could be left unused, or the Department may investigate possible uses which would be electromagnetically compatible with services in adjacent blocks. It should be noted that the equipment availability to deploy radio systems in the frequency range in the guardbands is unclear at this time. The Department could auction the spectrum in the guardbands (as done in the United States).

5-1. Based on the criteria listed above, which of the four band plan options should be adopted in Canada? Why is this option preferred over the other options? If Option 3 (APT band plan) is selected, what should the block sizes be?

In providing your responses, include supporting arguments, including potential benefits to wireless subscribers.

5-2. The band plans presented in the options above include guardbands. Should the Department auction the guardbands, or should these frequencies be held in reserve for future use such that they are technically compatible with services in the adjacent bands?

Also comment on any related aspects not addressed above or other possible options, including combinations of options.

5.2 Options for use of 758-768 MHz Paired with 788-798 MHz for Public Safety and/or Commercial Systems

The public safety community uses spectrum to communicate on a day-to-day basis, in emergency situations and for disaster relief. Land mobile systems are used by public safety agencies to provide critical communications between individuals, to large groups at the same time and between individuals and command centres. Mobile broadband applications may be used by public safety agencies to provide information such as pictures, blueprints, real-time video feeds, fast record transfer, etc., which could improve situational awareness and response time.

Communication among public safety agencies is imperative, particularly in the event of an emergency or a disaster. Therefore, interoperability is an important requirement for the public safety community. Common spectrum for public safety systems is one of several means to facilitate interoperability.

Following the release of the consultation paper seeking comments on various aspects of radio interoperability in June 2006, the Department published the Radio Systems Policy RP-25, *Policy Principles for Public Safety Radio Interoperability*, in June 2009. In RP-25, the Department defines public safety services as services involving safety of life and property. The Department further defines the categories of users or agencies that may be eligible for licensing in designated public safety spectrum as follows²¹:

- Category 1 – police, fire and emergency medical services;
- Category 2 – forestry, public works, public transit, hazardous material clean-up, border protection, and other agencies contributing to public safety; and
- Category 3 – other government agencies and certain non-governmental organizations or entities.

In addition, the policy indicates that radio interoperability is the capability of a public safety agency to communicate by radio (either directly or via a network) with another public safety agency, on demand (planned and unplanned) and in real time. It also provides examples of what constitutes multi-jurisdictional radio interoperability, which could include communicating with U.S. public safety agencies.

Finally, the Department indicated in RP-25 that, for each band designated for public safety, it will establish the requirements and priority for licensing based on consultations and the categories listed above. The Department will also establish, through future public consultation, specific radio interoperability requirements for the spectrum to be designated or made available for public safety.

Public safety systems operate in many frequency bands. As mentioned above, there are designated bands for public safety (listed in Table 5.5 below), where public safety agencies have exclusive use. Additionally, public safety agencies are major users in the VHF and UHF land mobile bands.

Table 5.5 – Bands Designated for Public Safety

Designated Public Safety Bands	Amount of Spectrum	Utilization
220-222 MHz	0.15 MHz	Land mobile : 15 x (5 + 5) kHz channels throughout the 220-222 MHz band
764-768 MHz and 794-798 MHz	8 MHz	<i>Under discussion in this consultation</i>
768-776 MHz and 798-806 MHz	16 MHz	Land mobile: Narrowband + Wideband
821-824 MHz and 866-869 MHz	6 MHz	Land mobile
4940-4990 MHz	50 MHz	Broadband mobile and fixed

²¹ At this time, the Department is not seeking comments on the definition of public safety services, the definition of interoperability, or the categories of use described above in the context of wireless broadband. These items may be addressed in a further consultation addressing specific public safety aspects.

The 220 MHz and 700 MHz bands designated for public safety use are fairly new and licensing has only begun. Details on the 700 MHz public safety band are provided in the following pages. The narrowband portion of the 700 MHz public safety band also includes interoperability channels, aligned with the United States, which can be used for cross-border communications.

The 800 MHz public safety band has been in use since the mid 1990s. Use of this band has doubled since 1998, and it is now at the point where there are very few available channels in metropolitan areas.

The 4.9 GHz band was designated for public safety broadband in 2006 in order to harmonize with the United States and to facilitate interoperable networks and services among public safety agencies. However, at these higher frequencies, more infrastructure (i.e. towers and backhaul) is required given that signals only travel over short distances and have reduced penetration through walls and other physical obstacles. Consequently, a network in the 4.9 GHz band will have very limited mobility, may employ specific topologies (e.g. mesh network) and will be used for specific applications not requiring wide area coverage. The scarcity of equipment available to date makes it even more difficult to deploy in this band. As a result, there is currently very limited deployment in this band.

In order to have a complete public record, the Department invites all respondents, in particular the public safety and commercial stakeholders, to provide comments to the following questions.

5-3. Do public safety agencies need spectrum for broadband applications? If so:

- (a) How much and for which type of applications?**
- (b) What are the anticipated deployment plans and the possible constraints, if any, in implementing these plans?**
- (c) Is there suitable alternate spectrum to the 700 MHz to meet these broadband requirements?**

5-4. Comments are sought on the need for public safety broadband radio systems to be interoperable:

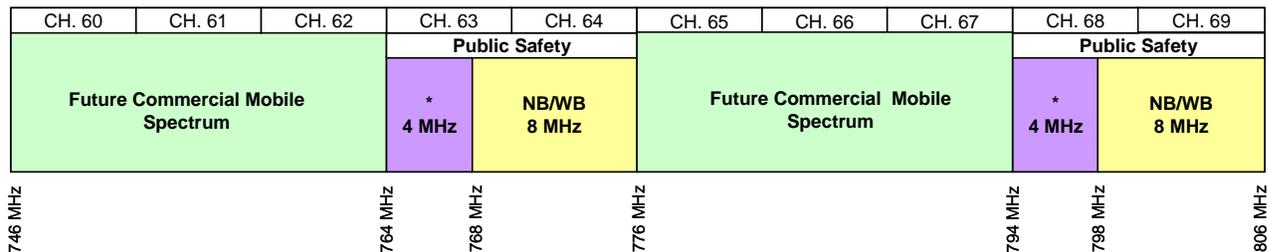
- (a) between various Canadian public safety agencies;**
- (b) between Canadian and U.S. public safety agencies.**

5-5. What are the challenges faced today by public safety agencies to have cross-border radio interoperability in other frequency bands?

Supporting rationale for your responses to the above questions should be provided.

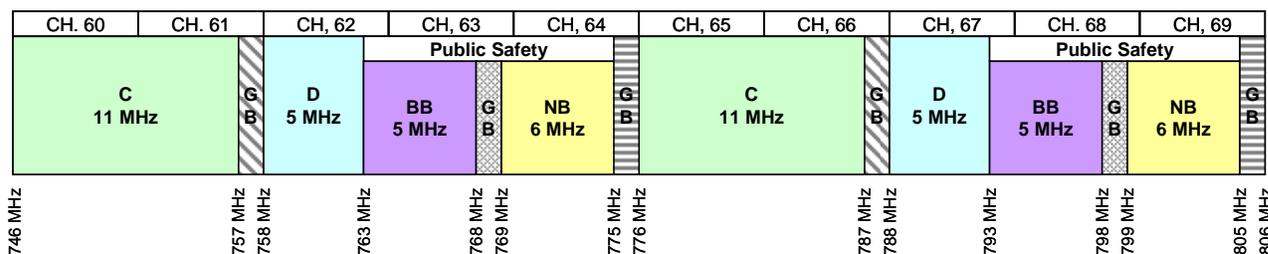
In June 2009, Industry Canada adopted a band plan for spectrum designated for public safety in the Upper 700 MHz band similar to the band plan adopted in the United States. The Canadian and U.S. band plans are shown in Figure 5.7, (a) and (b) respectively.

Figure 5.7 - Canadian and U.S. Band Plan for Public Safety



* In the band plan adopted in 2009, it was indicated that “This block will be subject to a future consultation”

a) Existing Canadian Band Plan



b) U.S. Band Plan

Note: In Canada, the narrowband/wideband designation for public safety includes the spectrum designated as guardbands in the United States: 768-769/798-799 MHz and 775-776/805-806 MHz.

In the United States, the sub-bands 763-768 MHz and 793-798 MHz (10 MHz in total) are designated for public safety broadband. While the PSST holds the single nationwide licence for the 700 MHz public safety broadband spectrum, the FCC is currently issuing waivers for various public safety agencies for the deployment of local and/or statewide public safety broadband networks.

The sub-bands 758-763 MHz and 788-793 MHz, which are collectively referred to as the “D Block” (originally intended for use by a public-private partnership), are also designated for mobile broadband. The Government of the United States has yet to decide who will have access to the D Block and how that will happen. There is general agreement that public safety agencies would only need access to the D Block in emergency events; however, it is also recognized that densely populated areas such as New York City might require access on a daily basis. Views are divided on the issue of who should hold the licence. Some organizations are of the view that the D Block should be designated for use by public safety agencies, which would then lease their extra capacity to commercial operators, whereas others consider that the D Block should be auctioned for commercial use with public safety agencies being given roaming and priority access rights.

In the context of public safety agencies using commercial mobile systems, priority access is generally defined as a system capability enabling calls or traffic sessions with higher priority to be placed at the front of the traffic management queue for system resources. In cases of congestion, a high priority call or data session would have to wait until radio system resources are freed, and then would be the first one to be serviced while other lower priority requests (even if placed earlier) would continue to wait in queue.

Preemption allows a higher priority call to displace lower priority calls. When there is congestion, the system will terminate other lower priority calls or data sessions, freeing radio system resources immediately in order to service the higher priority request.

In Canada, the sub-bands 768-776 MHz and 798-806 MHz (16 MHz in total) have been designated for public safety narrowband and wideband. Although an additional 8 MHz has also been designated for public safety in the sub-bands 764-768 MHz and 794-798 MHz, its use has yet to be defined. In Canada, in the 700 MHz band, there is currently no spectrum designated for public safety broadband. Furthermore, the sub-bands 758-764 MHz and 788-794 MHz, which correspond to the U.S. D Block plus an extra 1 MHz (763-764 MHz and 793-794 MHz), have not been subject to consultation.

5-6. Notwithstanding your responses to questions 5-3 to 5-5, the Department seeks comments on whether public safety broadband needs can be met by using commercial systems with priority access rights for public safety, at commercial rates.

- (a) Your views and comments are invited on priority access rights, including pre-emption, and on the feasibility of such a system.**
- (b) What public safety technical and operational requirements cannot be met by commercial systems, from either a public safety or commercial operator point of view?**
- (c) What specific rules, if any, should be mandated by the Department to make such a system viable?**

5-7. Comments are sought on the need for regional (local, provincial, etc.) dedicated broadband networks to provide access to all public safety agencies, and the institutional²² feasibility of implementing such a system.

5-8. Is there a need for a dedicated national interoperable broadband network to provide access to all public safety agencies? The Department seeks comments on the institutional feasibility of implementing such a system.

Provide supporting arguments for your responses to the above questions.

700 MHz Band Plan Architecture for Public Safety Systems

The current Canadian spectrum designation to public safety of 4 + 4 MHz does not align with the United States, would complicate cross-border interoperability and may require unique equipment to be developed. Therefore, it is not being considered as a practical band plan configuration.

In preparation for the auction of the 700 MHz commercial spectrum, Industry Canada is considering the following three options with respect to designating spectrum for broadband public safety and/or commercial systems use in the sub-bands 758-768 MHz and 788-798 MHz:

- **Option 1** designates 5 + 5 MHz to public safety systems and 5 + 5 MHz to commercial systems;

²² Governance, licensing structure, financing, technical and operational, etc.

- **Option 2** designates the entire 10 + 10 MHz of spectrum for commercial systems, with possible provisions for priority access for public safety systems;
- **Option 3** designates the entire 10 + 10 MHz of spectrum for public safety systems.

Options 1 and 3 assume that public safety agencies will deploy private broadband networks dedicated to public safety agencies, including radio access and backhaul networks. One of the considerations to be addressed is how to ensure that all public safety services (firefighters, paramedics and police) have access to the public safety broadband network.

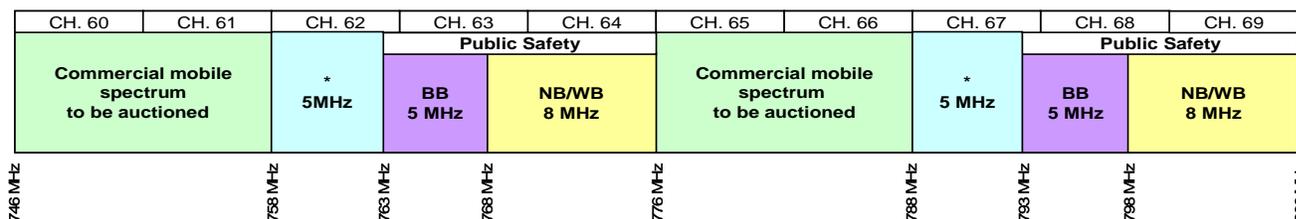
Considering that the sub-band 758-763 MHz/788-793 MHz (referred to as the “D Block”) is still under discussion in the United States regarding whether or not it will be attributed to public safety or if it will be auctioned, the Department may opt to wait until a decision is made in the United States before making a decision in Canada.

It should be noted that for all three options discussed below, no changes are proposed with respect to the sub-bands 768-776 MHz and 798-806 MHz that have already been designated for narrowband and wideband public safety use. It should be noted, however, that these 3 options would not be compatible with the APT band plan (Option 3 in Section 5.1).

Option 1: 5 + 5 MHz designated for public safety, 5 + 5 MHz to auction

Option 1 enables harmonization with the existing U.S. band plan by increasing the contiguous spectrum designated for public safety from 4 MHz + 4 MHz to 5 MHz + 5 MHz. With this option, the sub-bands 763-768 MHz and 793-798 MHz are designated for public safety broadband, whereas the remaining upper 700 MHz spectrum, including the spectrum that constitutes the “D Block” in the United States, is to be auctioned for commercial use, as shown in Figure 5.8. In addition, public safety agencies may be granted priority access rights over commercial systems in the sub-bands 758-763 MHz and 788-793 MHz.

Figure 5.8 - 700 MHz Public Safety Spectrum – Option 1



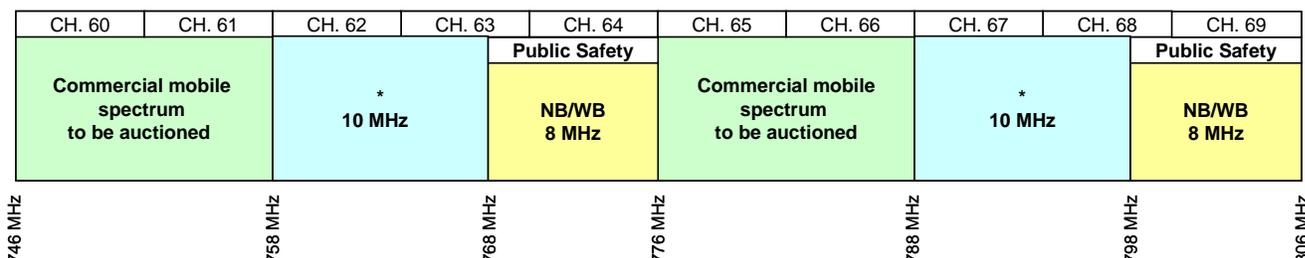
* This block refers to the D Block, as defined in the United States.

Option 2: 10 + 10 MHz to auction

Option 2 reassigns the spectrum previously designated for public safety in the sub-bands 764-768 MHz and 794-798 MHz for commercial use, as shown in Figure 5.9. This spectrum provides for 10 MHz + 10 MHz of contiguous spectrum for commercial operations. With Option 2, there is no 700 MHz broadband spectrum specifically dedicated for use by public safety agencies. Instead, the two blocks of spectrum (10 + 10 MHz) will be auctioned to commercial operators with possible provisions giving priority access rights to public safety agencies, such as pre-emption, and ensuring that both the

technical and interoperability (national and international) requirements specific to public safety are met. To meet these requirements, a Tier 1 (national) licensing area may be applicable for this band plan option or licensees may be obliged to agree to a single common technology standard.

Figure 5.9 - 700 MHz Public Safety Spectrum – Option 2

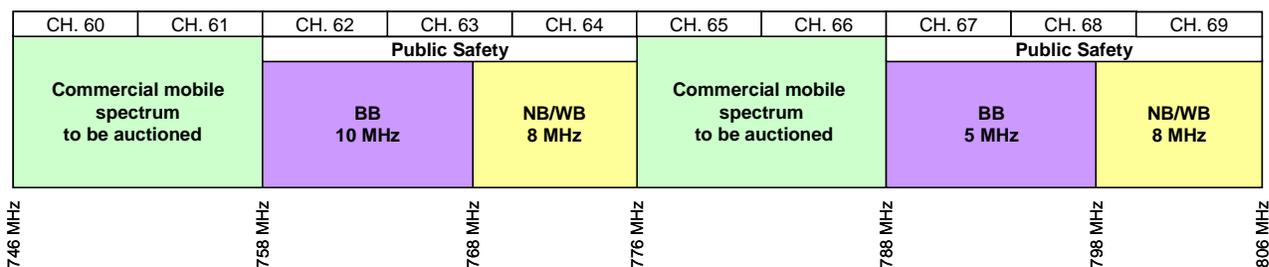


* This block includes the D Block commercial spectrum.

Option 3: 10 + 10 MHz designated for public safety

Option 3 designates the spectrum that comprises the “D Block” in the United States plus the extra 1 MHz in the sub-bands 763-764 MHz and 793-794 MHz for public safety broadband use, as shown in Figure 5.10. This spectrum, combined with the already designated public safety spectrum in the sub-bands 764-768 MHz and 794-798 MHz, provides for 10 MHz +10 MHz of contiguous spectrum, i.e. 758-768 MHz and 788-798 MHz, for public safety broadband operations.

Figure 5.10 - 700 MHz Public Safety Spectrum – Option 3



- 5-9. If band plan Option 1, 2a, or 2b in Section 5.1 is chosen, which one of the three options described above should be adopted and why is this option preferred over the other options? Provide supporting rationale.**
- 5-10. If commercial operators are mandated to support public safety services, what tier size should be applied in order to ensure adequate public safety coverage?**
- 5-11. If the APT band plan (See Option 3 in Section 5.1) is adopted:**
(a) Given that the APT band plan requires a 55 MHz duplexing separation, can Canadian public safety services operate their current narrowband systems in this band plan configuration? If not, what are possible alternatives to address public safety needs?

(b) Should spectrum be designated for dedicated public safety broadband systems, and how much?

You are also invited to comment on any related aspects that are not addressed above, including whether the decision should be delayed until the U.S. situation is known.

5.3 Tier Sizes for 700 MHz Auction of Commercial Spectrum

The licences for the 700 MHz band will be established in accordance with *The Service Areas for Competitive Licensing* document,²³ which outlines the general service areas that are proposed for an auction. The defined geographic areas have been categorized under “service area tiers” that are based on Statistics Canada’s Census Divisions and Subdivisions. The definition of the service areas within these tiers and accompanying maps and data tables are available on Industry Canada’s website. As different wireless services and applications are best suited to different service areas, four tiers of service areas have been established. Tier 1 is a single national service area. Tier 2 consists of 14 large service areas covering all of Canada. There are eight Tier 2 service areas that have provincial/territorial boundaries, and six that are within Ontario and Quebec. Tier 3 contains 59 smaller regional service areas and Tier 4 comprises 172 localized service areas. The population associated with each service area is based on Statistics Canada census information.

In general, Tier 1 and Tier 2 licences have typically been used for mobile services, whereas Tier 3 and 4 have typically been used for licensing fixed services.

AWS spectrum was auctioned using a mixture of Tier 2 and Tier 3 areas. As was shown in Figure 5.1, the 700 MHz band was auctioned in the United States as a mix of service areas to enable deployment under a variety of business models. The smallest area used by the FCC was the Cellular Market Area (CMA), which, population-wise, is roughly equivalent to the Tier 3 service areas in Canada.

The propagation characteristics of the 700 MHz band are most conducive to high mobility applications due to low over-the-air propagation losses and feasibility of small size antennas enabling the development of personal portable communication devices.

Licensing this spectrum based on larger geographic areas would result in fewer neighbouring service providers, translating into less coordination between licensees and more effective use of radio spectrum. Moreover, large service areas could foster regional mobile services, which could reduce the number of roaming arrangements between licensees.

Larger geographic service areas would also enable efficient large-scale networks due to economies of scale. Wireless mobile networks are capital-intensive. Considerable capital and operational costs are required for items not directly related to the provision of wireless coverage in the field (research and development, network interconnection(s), operation and support systems, marketing, etc.). These costs need to be supported from services marketed to a sufficiently large subscriber base. Furthermore, a large or national footprint may be an asset when marketing high mobility services.

²³ Service Areas for Competitive Licensing: http://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/h_sf01627.html

Licensing based on smaller tier sizes provides additional flexibility to bidders, who can concentrate on the geographic markets of most interest, or aggregate smaller service areas into larger regions corresponding to their business needs. This may result in potential lower costs for bidders, if the smaller markets (rural and remote areas) are unbundled from the high-density, high-revenue areas. It may also enable smaller local service providers to afford the less expensive licences and provide services in their communities.

As part of this consultation, the Department seeks comments on which tier size or combination of tier sizes should be used for auctioning the 700 MHz band.

The questions below seek comments on tier sizes specifically in relation to a respondent's preferred band plan. Comments pertaining to tier sizes as they relate to the promotion of service deployment in remote and rural areas are not considered below and should be addressed within the responses to Section 8 of this consultation.

5-12. The Department seeks comments on whether the auction of 700 MHz commercial spectrum should be based on uniform tier sizes across all spectrum blocks, or a mixture of tier sizes.

5-13. Based on your answer above, what tier size(s) should be adopted?

Provide supporting arguments for your responses to the above questions.

5.4 Treatment of Existing Spectrum Users

Besides over-the-air TV broadcasting, low-power devices, including wireless microphones, are currently licensed in the 700 MHz band. Full power TV broadcasting will be transitioned out of the band and new mobile broadband services will be deployed in the 700 MHz range. No decision has been made with regard to the treatment of low-power TV broadcasting which may continue to operate in the above bands following the DTV transition. Furthermore, no firm date has been established after which the use of low-power wireless devices, including wireless microphones, will be prohibited in the bands 698-764 MHz and 776-794 MHz.

The Department seeks comments on the options for the treatment of these existing users currently operating in the 698-764 MHz and 776-794 MHz bands.

Low-Power Television (LPTV) Broadcasting

In March 2010, the CRTC released *Broadcasting Regulatory Policy 2010-167* to announce its decision with regard to the analog-to-digital television broadcasting conversion. In this policy, the CRTC confirmed the deadline of August 31, 2011, for the transition of full-power analog transmitters operating in the 31 identified mandatory markets and for those operating on channels 52-69 outside the mandatory markets. The broadcasters outside the mandatory markets who choose not to convert to digital must either move their service(s) to a channel outside the 52 to 69 range or must cease operation of their analog transmitter(s).

In its decision, the CRTC did not make any provisions specific to LPTV broadcasting operations. Industry Canada is responsible for establishing the policy to accommodate these installations in the vacated TV spectrum. Following the DTV post-transition plan, approximately 60 LPTV stations will remain in the 700 MHz band, specifically in the 52-69 channel range.

Consistent with a letter sent to the CRTC in 2000,²⁴ Industry Canada indicated that, with respect to the DTV transition, “unless there are extraordinary circumstances, it will not issue broadcasting certificates for low-power TV stations in channels 60-69.” This moratorium on new broadcasting certificates for low-power TV stations remains in effect. In addition, effective immediately, no new broadcasting certificates will be issued for low power TV stations in TV channels 52-59 (698-746 MHz).

As indicated in Broadcasting Procedures and Rules Part 4 (BPR-4), *Application Procedures and Rules for Television Broadcasting Undertakings*, LPTV stations are considered as secondary assignments, on a no-interference, no-protection basis to TV stations operating on allotted channels and to other radio services. LPTV stations are only entitled to protection from other low-power stations authorized at a later date and from very low-power television stations.

The Department proposes that a transition policy for the LPTV stations be implemented based on the displacement of incumbents on a “where necessary” basis. The continued operation of existing LPTV systems in remote and rural areas will be permitted if it does not prevent the deployment of new broadband mobile systems. LPTV station licensees would be afforded a notification period before displacement following the licensing of new services in the 700 MHz band.

Effective immediately, no new broadcasting certificates will be issued for LPTV stations in TV channels 52-59 (698-746 MHz).

The Department proposes that the displacement of the incumbent LPTV stations be subject to a notification period of one year for LPTV stations located in urban areas²⁵ or in specific geographic areas, such as along highway corridors; and a period of two years for LPTV stations in all other areas. A displacement notification can be issued only after technical determination is made concluding that continued operation of the incumbent LPTV station would impede the deployment of new licensed systems in the 700 MHz band.

5-14. The Department seeks comments on the transition policy proposed above.

Low-power licensed devices, including wireless microphones

The band 698-806 MHz has been widely used by low-power licensed radiocommunication devices, including wireless microphones, subject to licensing on a no-protection, no-interference basis. In

²⁴ Public Notice CRTC 2000-127 — Call for Comments on a Licensing Framework for Low-power Community Television Undertakings in Urban Areas, and in Other Markets Not Covered by Existing Policy (<http://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf08086.html>)

²⁵ As defined by Statistics Canada.

Spectrum Advisory Bulletin SAB-001-10,²⁶ released in January 2010, Industry Canada announced that no new licences for low-power licensed radiocommunication devices will be issued nor will the Department accept applications for certification of such devices in the band 698-806 MHz. In bands other than 764-776 MHz and 794-806 MHz, which are dedicated to public safety systems, wireless microphones were allowed to continue to operate, as per SAB-001-10.

Allowing low-power devices, including wireless microphones, to continue to operate in this band may cause interference to new commercial and possible future public safety deployments planned for this band. In the United States, the FCC is prohibiting the manufacturing, importation and sale of wireless microphones and other low-power auxiliary stations intended for use in the 700 MHz band in order to ensure that both public safety and commercial mobile licensees can operate interference-free in this band.²⁷ In Canada, implementing a similar ban on wireless microphones in the 700 MHz band will also limit the number of wireless microphones entering the country.

In addition, Radio Standards Specifications RSS-123, *Low Power Licensed Radiocommunication Devices*, and Client Procedure Circular CPC-2-1-11, *Low-power Licensed Radiocommunication Devices*, are currently under review and will be updated accordingly in order to revise the applicable equipment standards and licensing of these devices.

RSS-123 and CPC-2-1-11 will also be modified to include stopping the manufacturing, importation, distributing, leasing, offering for sale or selling of any equipment that does not comply with the applicable revised standards, in the band 698-806 MHz. This prohibition will also apply to all equipment, including equipment that has been certified to meet the former standards.

In accordance with SAB-001-10, these devices are permitted to operate in the public safety bands, 764-776 MHz and 794-806 MHz, only until March 31, 2011. The Department proposes to publish an additional Spectrum Advisory Bulletin to permit operation of these devices in the remaining bands (698-764 MHz and 776-794 MHz) only until March 31, 2012.

5-15. The Department seeks comments regarding its proposal to permit low-power licensed devices, including wireless microphones, to operate in the band 698-764 MHz and 776-794 MHz only until March 31, 2012.

6. Changes to Canadian Table of Frequency Allocations

At the 2007 World Radio Conference (WRC-07), the ITU identified additional spectrum for use by IMT systems within the 698-862 MHz UHF band and allocated this spectrum to the mobile service. More specifically, for each ITU Region,²⁸ IMT is now identified for use in:

²⁶ SAB-001-10, *Low-power Licensed Radiocommunication Devices, Including Wireless Microphones, in the Band 698-806 MHz* (<http://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf09777.html>)

²⁷ R&O and FNPRM FCC 10-16 (http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-10-16A1.pdf)

²⁸ Details regarding ITU regional structures are found on the ITU website (<http://www.itu.int>).

- Region 1: 790-960 MHz
- Region 2: 698-960 MHz
- Region 3: 790-960 MHz²⁹

Internationally, portions of the UHF band are currently being used for television broadcasting in some countries. From a technical perspective, this band is of particular interest to the industry for mobile broadband services due to favourable propagation characteristics that allow for the deployment of cost-effective wide area networks and enhanced in-building coverage.

Frequency allocations are an important first step in developing spectrum utilization policies that foster the implementation of new radiocommunication services. Modifications to the *Canadian Table of Frequency Allocations* (herein referred to as the Canadian Table) are intended to reflect the public interest in introducing new wireless services that benefit Canadians and respond to marketplace demands. As a result, the Department is proposing several modifications to the Canadian Table to allow for the implementation of new mobile services in the 700 MHz band, including commercial mobile radio services.

Currently, the Canadian Table allows for the Broadcasting and Mobile services in certain portions of the 700 MHz band as follows:

Table 5.6: Excerpt from the Canadian Table of Frequency Allocations, 2009 Edition

614 - 746	BROADCASTING 5.293 C24
746 - 806	BROADCASTING MOBILE 5.317A C7 5.293 C22 C24

The footnotes in the Canadian Table are currently defined as follows:

5.293 *Different category of service:* in Canada, Chile, Colombia, Cuba, the United States, Guyana, Honduras, Jamaica, Mexico, Panama and Peru, the allocation of the bands 470-512 MHz and 614-806 MHz to the fixed service is on a primary basis (see No. **5.33**), subject to agreement obtained under No. **9.21**. In Canada, Chile, Colombia, Cuba, the United States, Guyana, Honduras, Jamaica, Mexico, Panama and Peru, the allocation of the bands 470-512 MHz and 614-698 MHz to the mobile service is on a primary basis (see No. **5.33**), subject to agreement

²⁹ Although 790-960 MHz was identified for IMT in Region 3, Bangladesh, China, Korea (Rep. of), India, New Zealand, Papua New Guinea, Philippines and Singapore also identified the band 698-790 MHz to align with Region 2. The frequency arrangements for the respective regions are found in the document ITU-R M.1036-2.

obtained under No. **9.21**. In Argentina and Ecuador, the allocation of the band 470-512 MHz to the fixed and mobile services is on a primary basis (see No. **5.33**), subject to agreement obtained under No. **9.21**. (**WRC-07**).

5.317A Those parts of the band 698-960 MHz in Region 2 and the band 790-960 MHz in Regions 1 and 3 which are allocated to the mobile service on a primary basis are identified for use by administrations wishing to implement International Mobile Telecommunications (IMT). See Resolutions **224 (Rev. WRC-07)** and **749 (WRC-07)**. This identification does not preclude the use of these bands by any application of the services to which they are allocated and does not establish priority in the Radio Regulations. (**WRC-07**).

C7 (**CAN-09**) International Footnote **5.317A** provides administrations with the flexibility to implement International Mobile Telecommunications (IMT) in parts of the band 698-960 MHz that are allocated to the mobile service on a primary basis. For the time being, the application of **5.317A** is limited to the bands designated for cellular mobile telephony and trunked mobile systems. The bands 824-849 MHz and 869-894 MHz are designated for cellular telephony services and the bands 806-821 MHz, 851-866 MHz, 896-902 MHz and 935-941 MHz are designated for trunked mobile services and, as such, can evolve to accommodate IMT service capabilities.

C22 (**CAN-04**) In the band 746-806 MHz, the gradual use of spectrum for the mobile service will be subject to the development of a series of spectrum utilization policies as the transition of digital television progresses.

C24 (**CAN-04**) In the bands 470-512 MHz and 614-806 MHz, international footnote **5.293** has raised the fixed and mobile services to a co-primary status with the broadcasting service for Canada. To support broadcasting requirements during the transition to digital television, the Department is only allocating the mobile service in the band 746-806 MHz at this time. The Department will carry out public consultation in the future in order to adopt the other service allocation provisions of international footnote **5.293** in the frequency bands 470-512 MHz and 614-746 MHz.

The Department proposes to make the following changes to the Canadian Table in the band 614-806 MHz:

- modify the split between the bands 614-746 MHz and 746-806 MHz as follows: 614-698 MHz and 698-806 MHz;
- extend the co-primary mobile service allocation to include 698-746 MHz;
- add a co-primary fixed allocation for the 698-806 MHz range;
- suppress footnote C22 (**CAN-04**) given that spectrum utilization policies for this band will be developed as a result of this consultation;
- modify footnote C24 (**CAN-04**) to change the frequency range subject to a future consultation on adopting the other service provisions of **5.293** from 614-746 MHz to 614-698 MHz and to delete certain parts of the footnote pertaining to the transition to digital television; and
- extend the revised international footnote **5.317A** (Footnote C7), which allows administrations the flexibility to implement IMT in the band 698-746 MHz.

Taking into consideration the proposed changes to the band 698-806 MHz, the following modifications to the Canadian Table are proposed.

614 – 698 746 BROADCASTING 5.293 MOD C24
746-698 - 806 BROADCASTING <u>FIXED</u> MOBILE 5.317A MOD C7 5.293 C22 C24

SUP

~~C22 (CAN-04) In the band 746-806 MHz, the gradual use of spectrum for the mobile service will be subject to the development of a series of spectrum utilization policies as the transition of digital television progresses.~~

MOD

C24 (CAN-04) In the bands 470-512 MHz and 614-806 MHz, international footnote **5.293** has raised the fixed and mobile services to a co-primary status with the broadcasting service for Canada. ~~To support broadcasting requirements during the transition to digital television, the Department is only allocating the mobile service in the band 746-806 MHz at this time.~~ The Department will carry out public consultation in the future in order to adopt the other service allocation provisions of international footnote **5.293** in the frequency bands 470-512 MHz and 614-698 MHz.

MOD

C7 (CAN-09) International Footnote **5.317A** provides administrations with the flexibility to implement International Mobile Telecommunications (IMT) in parts of the band 698-960 MHz that are allocated to the mobile service on a primary basis. For the time being, the application of **5.317A** is limited to the bands designated for cellular mobile radio systems ~~cellular mobile telephony and trunked mobile systems~~. The bands 698-764³⁰ MHz and 776-794²⁹ MHz, 824-849 MHz and 869-894 MHz are designated for cellular mobile radio systems ~~cellular telephony services~~ and the bands 806-821 MHz, 851-866 MHz, 896-902 MHz and 935-941 MHz are designated for trunked mobile services and, as such, can evolve to accommodate IMT service capabilities.

6-1. The Department seeks comments on its proposed changes to the *Canadian Table of Frequency Allocations* for the band 698-806 MHz.

³⁰ The frequencies 764 MHz and 794 MHz are subject to change pending decisions made in this consultation.

Spectrum Utilization Policy

In RP-014, issued in 1995, Industry Canada clarified the definition of a cellular mobile radio service (CMRS), and placed no limitations on the types of mobile radio or personal communications applications to be deployed in the cellular mobile bands.

The Department proposes to refer to the commercial radio systems to be deployed in the 700 MHz band as Mobile Broadband Services (MBS). The MBS systems would be compliant with the RP-14 definition for CMRS. Subject to technical compatibility considerations, there will be no restrictions on the services to be offered by licensees under MBS. The 700 MHz band will be dedicated to MBS with the exception of any frequency ranges possibly designated for public safety.

6-2. The Department seeks comments on the spectrum utilization policy proposed above.

7. Promoting Competition

7.1 Possible Need to Promote Competition

As described in Section 4.1, until recently, the Canadian wireless market was comprised primarily of three large service providers, Bell, Rogers and TELUS, as well as a number of regional providers, e.g. SaskTel Mobility and of several Mobile Virtual Network Operators (MVNOs). The Department has acted to encourage a competitive telecommunications marketplace, as it believes that competition stimulates innovation and investment in the industry, which can lead to lower prices, better services and more choice for consumers and businesses.

In 2007, in pursuit of these objectives, the terms of the Advanced Wireless Services (AWS) auction included a spectrum set-aside exclusively for eligible bidders. A number of new entrants responded by acquiring this set-aside, and other spectrum. Some of these new entrants, Public Mobile, Mobilicity, Wind Mobile, Videotron and others have already launched service resulting in a more competitive wireless marketplace, but with unknown impact as of yet on consumer prices and services.

The following questions examine the need for possible measures to promote competition in the Canadian wireless services market(s).

7-1. The Department seeks comments on the current state of competition and its anticipated evolution, including the impact on consumers in the Canadian wireless services market:

- (a) in general;**
- (b) in terms of its contributions and interaction to the broader Canadian telecommunications service market;**
- (c) in comparison with the wireless markets of other jurisdictions.**

- 7-2. Provide views, and any supporting evidence, on the impacts of government measures adopted in the AWS auctions, including the impacts on consumers and on the state of competition. In particular, what has been the impact, if any, of such measures on industry concentration, barriers to entry or expansion of services, and the availability of new or improved service offerings and pricing plans?**
- 7-3. In light of the current conditions in the Canadian wireless service market(s), is there a need for specific measures in the 700 MHz and/or 2500 MHz auction to increase or sustain competition?**
- 7-4. The Government of Canada has undertaken a consultation on potential changes to the foreign investment restrictions³¹ that apply to the telecommunications sector. How would the adoption of any of these proposed changes impact your responses to the questions above?**

Provide supporting evidence and rationale for all responses.

7.2 Specific Mechanisms Applicable to the 700 MHz and 2500 MHz Auctions

Industry Canada will use an auction mechanism to award spectrum in both the 700 MHz and the 2500 MHz bands. Auctions are a transparent, fair and efficient spectrum assignment mechanism. The *Framework for Spectrum Auctions in Canada*³² notes that there are various measures available in an auction to promote a competitive marketplace if required, notably spectrum caps and set-asides.

Developments in the 700 MHz and 2500 MHz bands demonstrate that both are suitable for the deployment of advanced mobile/broadband networks and services to meet growing consumer demands. In the recent consultation *DGSO-001-10 – Decisions on the Transition to Broadband Radio Service (BRS) in the Band 2500-2690 MHz and Consultation on Changes Related to the Band Plan*, it is noted that BRS comprises a wide range of applications, primarily data, multimedia, Internet Protocol (IP)-based applications and broadband Internet access using post third-generation (3G) technologies.

Those participating in the 700 MHz and 2500 MHz auctions may see a benefit in acquiring a combination of spectrum in both bands to complement existing networks and/or deploy new networks and services, whereas others may not. Consequently, the Department will consider the issue of promoting competition (discussed below) in the context of both bands. Measures involving spectrum in both the 700 MHz and 2500 MHz bands could be adopted either in a combined auction format or separately if the two auctions are conducted individually.

³¹ For details, refer to *Opening Canada's Doors to Foreign Investment in Telecommunications: Options for Reform* (<http://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf09919.html>).

³² For details, refer to (<http://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf01626.html>).

Spectrum Aggregation Limits and Spectrum Set-Asides

Recognizing that there are various mechanisms in an auction process that can be used to promote competition, the Department has intervened in the past by using mechanisms such as spectrum aggregation limits (spectrum caps) and spectrum set-asides to foster competition. The same options could be considered should the Department decide that specific measures are necessary to promote competition in the wireless service market.

Spectrum Aggregation Limits (Spectrum Caps)

Spectrum aggregation limits (spectrum caps) restrict the amount of spectrum that any eligible bidder and its affiliates can purchase in a particular geographical region.

A spectrum cap was set for the 2001 PCS auction, effectively allowing for the entry of two new licensees. The cap had been applied to the combination of cellular (800 MHz), PCS (at 2 GHz) and other similar high-mobility radiotelephony services in the 800 MHz range, such as enhanced specialized mobile radio (ESMR), in order to ensure that new entrants had access to sufficient spectrum to effectively compete with the existing carriers. The cap was subsequently removed in 2004 due, in large part, to the opening of several other mobile bands and the convergence occurring with similar services and technologies.

Spectrum caps have also been used to prevent excessive concentration of spectrum at the time of opening new bands for competitive services. Such an aggregation limit was employed in the auction of the 2.3 GHz and 3.5 GHz bands and remained in effect for a period of two years following the close of the auction.

Setting the right cap amount is essential. If the limit is too low, there may not be enough spectrum to satisfy the business needs of some companies. If it is set too high, it might fail to fulfill the goal of preventing spectrum concentration. Another factor to be considered when applying a spectrum cap is how it should be applied, e.g. whether the cap should apply only to the spectrum being auctioned, to spectrum that is held across one or more bands, or whether it should apply differently across various bidders. How it is applied could limit the efficient allocation of the spectrum.

Possible options for implementation of a spectrum cap may include:

- (a) spectrum to be auctioned in individual bands (700 MHz separately from 2500 MHz);
- (b) a combination of spectrum to be auctioned in both bands (700 MHz and 2500 MHz); and
- (c) a combination of spectrum to be auctioned as well as existing spectrum holdings in all or a subset of bands available for commercial mobile systems (Cellular, PCS, AWS, BRS), e.g. spectrum holdings below 1 GHz.

Industry Canada recognizes that different licensed service areas for Cellular, PCS, AWS and BRS may create difficulties for the possible implementation of spectrum caps involving more than one spectrum band.

Spectrum Set-aside

A spectrum set-aside occurs where eligibility to bid for a specific block is limited to entities that meet predefined criteria. A set-aside was used in the 2008 AWS auction where only new entrants, defined as participants holding less than 10% of the national wireless market, were permitted to bid on three (3) of the available eight (8) blocks of spectrum. Restrictions were also imposed to ensure that the set-aside spectrum would not be transferred to companies that did not meet the “new entrant” criterion for a period of five (5) years from the date of issuance.

A set-aside mechanism is established in the context of specific block(s) sizes and geographic dimension of the licences. Ideally, where there is more than one set-aside block, they should be side by side so that eligible bidders could acquire contiguous spectrum, both spectrally and geographically. Having a set-aside block(s) ensures that one or more designated entities will be assigned spectrum; however, qualified entities still have to bid competitively among themselves for the set-aside spectrum. The size of the set-aside is also a consideration in that it should be a sufficient amount of spectrum so that a designated entity could provide competitive services to Canadians. Restrictions on secondary market transactions and transferability on set-aside spectrum may need to be imposed for a specific time frame to limit opportunities for economic arbitrage of spectrum.

Should the Department decide to implement one of these measures, it will need to determine who should be subject to the spectrum aggregation limit or who will be eligible to access the set-aside spectrum during the auction, for example, solely the bidder, or also the bidders’ affiliates and associated entities.

The following questions seek comments as to which mechanisms could be used to promote competition. With regard to the 700 MHz band, the possible market measure decisions could be influenced by pending decisions on specific band plans (Section 5.1), on spectrum for public safety systems (see Section 5.2), tier sizes (Section 5.3) and open access requirements (Section 9).

7-5. If the Department determines that there is a need for measures to promote competition, which of the above mechanisms would be most appropriate and why should this mechanism be considered over the other? Comments should also indicate if further restrictions should apply so that policy objectives are met, for example, over a given time period?

In light of your response above, and recognizing that pending decisions on the specific band plan, spectrum for public safety system, tier sizes and open access requirements could influence your response:

- 7-6. (a) If the Department were to implement spectrum aggregation limits (caps):**
- (i) Should the cap apply to the 700 MHz band only or be broader?**
 - (ii) What should the size of the cap be?**
 - (iii) Should bidders and their affiliates or associates share the cap?**
 - (iv) How long should the cap remain in effect?**

- (b) If the Department were to implement a set-aside in the 700 MHz auction:**
- (i) Who should be entitled to bid in the set-aside block(s) and should the entitled bidders be restricted to bidding on the set-aside only?**
 - (ii) How much spectrum should be set-aside and which block(s) should be set-aside?**
 - (iii) If the set-aside were to include multiple blocks of spectrum, should they be contiguous?**
 - (iv) What restrictions should be put in place to ensure that policy objectives are met (for example, should trading of the set-aside spectrum be restricted for a given time period)?**

7-7. Are there other mechanisms that should be considered and, if so, how should these be applied?

7-8. The Government of Canada has undertaken a consultation on potential changes to the foreign investment restrictions that apply to the telecommunications sector. How would the adoption of any of the proposed changes affect your responses to the questions above?

Provide supporting evidence and rationale for all responses.

Note: The possible implementation of a set-aside regarding the 2500 MHz spectrum to be auctioned will be dealt with in a separate consultation.

8. Promoting Service Deployment in Rural Areas

One of the objectives of the *Telecommunications Act* is to promote the availability of reliable and affordable telecommunications service to all regions of Canada. However, Canada's geography and widely dispersed population can render it difficult to make a business case for the deployment of advanced, innovative services in some rural and remote areas of the country. Consequently, some sparsely populated areas of the country may not have access to the advanced broadband services needed to prosper in today's digital economy.

Several government initiatives have been developed to promote and advance the availability of advanced services, or broadband connectivity in rural and remote areas.

As a component of *Canada's Economic Action Plan*, the Broadband Canada: Connecting Rural Canadians program aims to support the provision of essential broadband connectivity infrastructure to Canadians in remote and rural areas by providing an incentive to Internet service providers to extend

their networks. The program aims to extend broadband service to as many unserved and underserved Canadian households as possible. In addition, the CRTC recently approved the use of deferral accounts towards investments for deployments of broadband services in unserved communities.³³

The recent *Consultation Paper on a Digital Economy Strategy for Canada* sought views on how the government can best ensure that rural and remote communities are not left behind in terms of access to advanced networks and on suggested priority areas for attention in these regions.

Industry Canada continues to seek advice and consider options for promoting deployment in rural, remote and low-density areas, both within specific auction processes, and within a broader policy context, noting that the challenges encountered in such areas can vary based on a number of factors, including geography, population density and the state of the marketplace.

Through other consultations initiated by Industry Canada, some respondents have identified access to spectrum as an impediment to the deployment of advanced services in rural areas. Since 1999, the Department has used auctions to assign spectrum in situations where spectrum demand exceeds supply. In addition to the auction process, there exist several options for stakeholders to access spectrum in rural or remote areas. For example, a spectrum licensee may apply to transfer its licence(s) in whole or in part (divisibility), in both the bandwidth and geographic dimensions. This creates an opportunity for those interested in providing service in rural areas to approach current licensees to discuss a mutually beneficial commercial arrangement for access to spectrum already licensed. There has been some secondary market activity in the PCS, 2500 and 3500 MHz bands, as well as in the 24 and 38 GHz bands in the past where the Department approved applications for licence transfers and divisions, as well as subordinate licence applications. Upon receipt of an application signed by both interested parties, the Department verifies that the licensee and transferee meet the eligibility criteria and all other conditions of licence, technical or otherwise, prior to consideration for ministerial approval. Upon approval, the necessary changes to the related licences are implemented.

Within an auction process, an opportunity exists where parties wishing to serve various rural or remote communities within a tier area can form a bidding consortium and enter the auction with the goal of obtaining a licence and then having each consortium member provide service to a portion of the licensed tier area.

In the *Consultation on the Revisions to the Framework for Spectrum Auctions in Canada and Other Related Issues*, some stakeholders provided comments in favour of the development of a smaller tier that separates rural and urban areas. They suggested that this would reduce barriers to the provision of rural

³³ Telecom Decision CRTC 2010-637, Follow-up to Telecom Decision 2008-1 – Proposal by Bell Aliant Regional Communications, Limited Partnership and Bell Canada to dispose of the funds remaining in their deferral account, August 31, 2010, as amended by Telecom Decision CRTC 2010-805, Bell Canada – Applications to review and vary certain determinations in Telecom Decision 2010-637 concerning the use of high-speed packet access wireless technology and the deferral account balance, October 29, 2010;

Telecom Decision CRTC 2010-638, Follow-up to Telecom Decision 2008-1 – Proposal by MTS Allstream Inc. to dispose of the funds remaining in its deferral account, August 31, 2010; and

Telecom Decision CRTC 2010-639, Follow-up to Telecom Decision 2008-1 – Proposal by TELUS Communications Company to dispose of the funds remaining in its deferral accounts, August 31, 2010.

service. However, most argued that Tier 4 should be the smallest subdivision, further noting that smaller tier sizes would not facilitate a viable and sustainable business case and would increase the complexity of frequency coordination issues.

Another option for accessing spectrum is outlined in RP-19. This policy allows for new parties who propose services in areas that are unserved or underserved to apply for a licence for spectrum already licensed to a cellular incumbent. Where mutually agreeable arrangements cannot be established between the two parties, new parties may apply through the RP-19 process for consideration. In addition, some PCS spectrum remains available for licensing on a first-come, first-served basis.

The superior propagation characteristics of the 700 MHz spectrum band make this spectrum well suited for broadband services in rural areas. This is due in part to the cost efficiencies resulting from fewer required towers to cover a given area. In the context of this specific spectrum band, the Department is seeking views on whether a need exists to promote service deployment in rural areas. Within their responses, stakeholders may wish to comment on the feasibility of options such as roll-out licence conditions specifically targeting deployment in rural areas, as well as the use of a geographical tier structure that would divide rural areas from urban.

8-1. In the above context, the Department seeks comments on challenges and specific problems affecting the deployment of broadband mobile services to low-density rural and remote areas.

8-2. Is there a need for further regulatory measures or changes to existing regulatory rules (e.g. RP-19) to facilitate service deployments in rural and remote areas that remain unserved and/or underserved?

8-3. Should the Department decide that measures are necessary, comments are sought on specific measures that could be adopted within the 700 MHz spectrum auction process to ensure further deployment of advanced mobile services in rural and remote areas (e.g. roll-out conditions, tier structure, etc.).

Rationale and supporting evidence that substantiate your responses should be provided.

9. Open Access

The next generation wireless networks (3G and 4G) are based on broadband IP connectivity. Based on the open IP standard, the new architecture enables the expansion of the wireless industry ecosystem. New participants (hardware and application developers, content providers, third party service providers) are now able to develop, market and make available a range of products and services directly to wireless end-users.

The latest generation of mobile devices include portable general use computers (smartphones, pads, notebooks, etc.) and modems to connect computers to the Internet (USB modems, embedded wireless modules, etc). Users of these advanced devices have an expectation to be able to use their mobile broadband devices with the same degree of flexibility and access as using a personal computer connected to the Internet.

Requirements for open platforms for devices and applications have been included in the FCC rules applicable to Block C (746-757/776-787 MHz) in the Upper 700 MHz band:

- *Open platforms for devices* – referring to the ability of device manufacturers to develop and of users to procure the devices of their choosing, as long as the wireless network is not negatively impacted.
- *Open platforms for applications* – referring to the ability of application developers to create and of users to download, install and use the applications of their choice, while complying with certain technical conditions related to the management of the wireless network.

Adopting an open access policy similar to that used in the United States would enable service providers and users in Canada to take advantage of economies of scale due to the larger U.S. market. Moreover, such policies could enable Canadians to participate more actively in the new digital economy as consumers, innovators and content creators.

On the other hand, recent advances in technology have already enabled more powerful end-user devices (smartphones) and more capable networks, with increased capacity and throughput speeds, which may preclude the need for such intervention. Higher capacity access to the Internet provides a platform for a wider range of applications so it is implicit that investments to increase network capacity may already benefit and reward innovative and creative ideas for applications. Furthermore, the user experience for mobile subscribers is continually improving, and users may now expect and demand additional flexibility in using a wide range of novel devices and applications. As a result, some of the open access provisions, as described above, may already be a part of the wireless industry marketplace. For example:

- users today are able to acquire handset or terminal devices within the GSM family of standards (GSM/GPRS/EDGE/HSPA) from third party retailers and then purchase wireless services from carriers with compatible networks; and
- many of the new devices currently retailed by wireless service providers are based on certain open platforms enabling flexibility in the development, distribution and use of third party developed applications.

9-1 The Department seeks comments on whether there is a need for government intervention to promote open access, by increasing access by users to handsets and/or applications.

9-2. If government intervention is needed, which of the following options should be implemented?

Option 1: Mandated open access requirements across all future commercial mobile bands

Option 2: Mandated open access requirements for the entire commercial mobile spectrum in the 700 MHz band.

Option 3: Mandated open access requirements for the “C Block” (746-757/776-787 MHz) as in the United States.

Please provide supporting arguments for your responses, and any additional comments related to provisions of open platforms for devices and applications.

10. Auction Timing

In parallel with the preparatory work to auction spectrum in the 700 MHz band, the Department has also begun preparatory work towards the eventual auction of spectrum in the 2500-2690 MHz range for BRS. The most recent consultation entitled *DGSO-001-10 – Decisions on the Transition to Broadband Radio Service (BRS) in the Band 2500-2690 MHz and Consultation on Changes Related to the Band Plan*³⁴ and comments received are available on Industry Canada’s website. High-capacity broadband mobile services could be offered in this band due to its good radio propagation characteristics and the prospect of relatively low-cost equipment. The 2500-2690 MHz band is the only band identified by the ITU on a global basis for IMT next generation mobile services.

In moving forward with the implementation of auctions of the spectrum in the 700 MHz and 2500 MHz bands, the Department must consider stakeholder requirements with regard to both bands. For example, consideration of the extent to which stakeholders perceive 700 MHz and 2500 MHz spectrum to be substitutes and/or complements of each other, and the extent to which these perceptions may vary across stakeholders.

³⁴ <http://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf09882.html>

In this regard, the Department is seeking views on the most appropriate timing for auction processes for both the 700 MHz and 2500 MHz bands.

10-1. The Department is considering three options to proceed with the 700 MHz and 2500 MHz bands auction processes:

Option 1: to conduct an auction for licences in the 700 MHz band first, followed by an auction for licences in the 2500 MHz band approximately one year later;

Option 2: to conduct an auction for licences in the 2500 MHz band first, followed by an auction for licences in the 700 MHz band approximately one year later;

Option 3: to conduct one combined auction for licences in both the 700 MHz and 2500 MHz bands, which would be six months later than the first auction in the case of separate auctions.

Industry Canada is seeking views on the merits or disadvantages of proceeding with each of the various options stated above. The Department seeks to understand the magnitude of interdependencies between the two bands from a business/operational perspective. Specifically, comments are sought as to the extent spectrum in these bands is interchangeable or complementary from both a technological and a strategic perspective. In addition, views on the business and financial capabilities of participating in a joint auction for both bands are sought. Comments should include the rationale for selecting one option rather than another.

11. Next Steps

Following a decision on the questions raised in this consultation paper, including a possible joint auction of the 700 MHz and 2500 MHz spectrum, Industry Canada will initiate a consultation on the licensing framework for the auctioning of this spectrum. This will include, but will not be limited to:

- (1) auction design, rules and attributes;
- (2) discussion regarding opening bids;
- (3) implementation details of government intervention to enhance competition, if applicable; and
- (4) licence conditions.

12. Submitting Comments

Respondents are requested to provide their comments in electronic format (WordPerfect, Microsoft Word or Adobe PDF) to the following e-mail address: Spectrum.Engineering@ic.gc.ca, along with a note specifying the software, version number and operating system used.

In addition, respondents are asked to number their paragraphs for ease of referencing. Submissions should also include an executive summary using a standardized report format (maximum 5 pages, double-spaced, in 12-point font).

Written submissions should be addressed to Manager, Mobile Technology and Services, DGEPS, Industry Canada, 300 Slater Street, Ottawa, Ontario K1A 0C8.

All submissions should cite the *Canada Gazette*, Part I, the publication date, the title and the notice reference number (SMSE-018-10). Parties should submit their comments no later than February 28, 2011, to ensure consideration. After the close of the comment period, all comments received will be posted on Industry Canada's Spectrum Management and Telecommunications website at <http://www.ic.gc.ca/spectrum>.

The Department will also provide interested parties with the opportunity to reply to comments from other parties. Reply comments will be accepted until March 30, 2011.

Following the initial comment period, the Department may, at its discretion, if needed to clarify significant positions or new proposals request additional information. In such a case, the reply comment deadline would be extended.

13. Obtaining Copies

All spectrum-related documents referred to in this paper are available on the Spectrum Management and Telecommunications website at www.ic.gc.ca/spectrum.

For further information concerning the process outlined in this document or related matters, contact:

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