



Industry  
Canada

Industrie  
Canada

SMSE-022-14  
December 2014

Spectrum Management and Telecommunications

Spectrum Utilization Policy

# **Decisions on Spectrum Utilization Policies and Technical Requirements Related to Backhaul**

Aussi disponible en français

**Canada**

# Contents

<b>1.0</b>	<b>Intent.....</b>	<b>1</b>
<b>2.0</b>	<b>Policy Objectives .....</b>	<b>1</b>
<b>3.0</b>	<b>Background .....</b>	<b>1</b>
<b>4.0</b>	<b>Purpose of Backhaul.....</b>	<b>2</b>
4.1	Spectrum Available for Backhaul in Canada.....	3
4.2	Current Usage and Future Demand.....	5
<b>5.0</b>	<b>Consideration of Specific Frequency Bands.....</b>	<b>8</b>
5.1	Underutilized Spectrum .....	8
5.2	Provision of Additional Two-Way Backhaul Spectrum .....	15
5.3	Retention of Existing Designations and Future Consultations .....	20
5.4	Additional Backhaul Spectrum Considerations .....	28
<b>6.0</b>	<b>Geographical Differences Policy Guideline.....</b>	<b>28</b>
6.1	Retention of the GDP Guideline .....	29
6.2	Technical Requirements Subject to the GDP Guideline.....	30
6.3	Frequencies Subject to the GDP Guideline .....	31
<b>7.0</b>	<b>Spectral Efficiency .....</b>	<b>31</b>
7.1	Economic Considerations .....	32
7.2	Technical Considerations.....	33
7.3	Designation Considerations .....	39
<b>8.0</b>	<b>Antenna Standards .....</b>	<b>39</b>
<b>9.0</b>	<b>System Capacities.....</b>	<b>42</b>
9.1	10 GHz Band (10.55-10.68 GHz).....	44
<b>10.0</b>	<b>Analog Systems.....</b>	<b>45</b>
<b>11.0</b>	<b>Introduction of One-Way Transmissions .....</b>	<b>47</b>
<b>12.0</b>	<b>Other Issues Raised by Commenters .....</b>	<b>48</b>
<b>13.0</b>	<b>Concluding Remarks .....</b>	<b>49</b>
<b>14.0</b>	<b>Obtaining Copies.....</b>	<b>49</b>

## **1.0 Intent**

Through the release of this document, Industry Canada hereby announces decisions resulting from the consultation process announced in *Canada Gazette* notice SMSE-018-12 — *Consultation on Spectrum Utilization Policies and Technical Requirements Related to Backhaul Spectrum in Various Bands, Including Bands Shared With Satellite, Mobile and Other Services*.

All of the backhaul decisions contained herein complement and advance the Department's initiatives to stimulate the deployment of mobile broadband across Canada. Specific provisions are intended to facilitate flexibility and maximize the economical use of the spectrum while minimizing the impacts of one service on another, in accordance with the [Spectrum Policy Framework for Canada](#) (SPFC).

## **2.0 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 for spectrum utilization and ensuring effective management of the radio frequency spectrum resource.

In developing policies and a technical framework to make additional spectrum available, Industry Canada takes into consideration the need to provide spectrum access for new services and technologies, including backhaul applications; the impact of such a framework on all stakeholders; and the SPFC. The policy objective of the SPFC is to maximize the economic and social benefits that Canadians derive from the use of the radio frequency spectrum resource. The SPFC's enabling guidelines state that spectrum management practices should be responsive to changing technology and marketplace demands. In addition, it states that spectrum policy and management should support the efficient functioning of markets by permitting the flexible use of spectrum to the extent possible and harmonizing spectrum use with international allocations and standards, except where Canadian interests warrant a different determination. The Department recognizes the benefits of implementing flexibility in a spectrum management program, which enables spectrum users to adapt to changing conditions, to the extent practical.

## **3.0 Background**

In December 2012, Industry Canada initiated a comprehensive consultation on spectrum utilization policies and technical requirements related to backhaul spectrum, which sought comments on the possible provisioning of additional spectrum available for backhaul, as well as views on updating standards and policies, with a view to increasing flexibility and the utilization of radio spectrum. Comments were sought on mechanisms to encourage: spectral efficiencies; efficiency standards in rural areas; and the use of smaller antennas. As well, views were sought on other possible modifications to policies in an effort to promote the flexible and efficient use of fixed backhaul services. The consultation also covered many frequency bands, generally above 3 GHz, addressing the needs and accommodating new growth within the wireless microwave industry. Interested parties were asked to submit their comments by April 22, 2013, and reply comments were due on May 24, 2013.

In response to this consultation paper, the Department received a total of 27 comments and reply comments from companies and associations, including wireless service providers, satellite service providers, hydro utilities, broadcasters, manufacturers, radio equipment suppliers and vendors regarding the provisioning of additional backhaul spectrum and the modernization of policies and technical frameworks to ensure increased utilization and efficiencies of the radio spectrum.

The following lists those organizations that provided responses to the consultation, noting that some organizations serve multiple industries and markets:

- ABC Communications;
- AVIAT Networks;
- BC Hydro;
- Bell Mobility Inc.;
- Canadian Electricity Association (CEA);
- CBC/Radio-Canada;
- CommScope Corporation (Andrew Solutions);
- Consumer Electronics Marketers of Canada (CEMC) / Electro--Federation Canada (EFC);
- Data & Audio-Visual Enterprises Wireless Inc. (Mobilicity);
- EchoStar Corporation (EchoStar);
- European Communications Office (ECO);
- MTS Inc. and Allstream Inc. (collectively MTS Allstream);
- Québecor Média inc. and Vidéotron s.e.n.c.;
- Radio Advisory Board of Canada (RABC);
- Rogers Communications (Rogers);
- Saskatchewan Telecommunications (SaskTel);
- Shaw Communications Inc. (Shaw);
- Siklu Communication Ltd.;
- TELUS Communications Company;
- TeraGo Networks Inc.;
- Utilities Telecom Council of Canada (UTC Canada);
- Satellite Operators — Telesat, Ciel Satellite Limited Partnership, SES Americom Inc., and Hughes Satellite Systems Corporation.

All comments and reply comments received in response to the consultation are available on Industry Canada's website at <http://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf10634.html> and <http://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf10652.html> respectively.

#### **4.0 Purpose of Backhaul**

Backhaul is defined as the “transport of aggregate communication signals from base stations to the core network.”<sup>1</sup> Backhaul facilities are an essential part of the infrastructure backbone that facilitates fixed and mobile broadband networks for the delivery of Internet, data and voice traffic. Moreover, backhaul

---

<sup>1</sup> Definition from various sources: ITU-R [Radio Regulations](#); ITU-R [Recommendations](#); *Canadian Table of Frequency Allocations*; and Industry Canada's [Standard Radio System Plans](#).

is also used to interconnect remote sites and buildings for corporate, health and educational purposes, to support broadcasting undertakings in the transmission of news gathering video, supervisory control and data acquisition within the oil, gas and electrical utility industries.

There are multiple backhaul solutions available, including fibre, wireless microwave, satellites and leased lines. The selection of a particular solution is dependent on a variety of factors and considerations, including technical performance, immediacy of deployment, capacity, cost, accessibility and feasibility of other options.

A combination of fibre and wireless microwave backhaul is generally employed throughout a network, reflecting the country's varied topography, distance between population centres, large number of rural and remote communities and for redundancy purposes, thus ensuring continual transmission for critical sites and improving network reliability. Fibre tends to be the first backhaul solution evaluated and primary mode employed for urban high-traffic cell sites given its large capacity and high reliability. Although wireless microwave solutions are more prevalent in remote and rural areas, they are also used for the fast deployment of small cells in metropolitan markets supporting competitive entry. Cost-effective, scalable and easy-to-deploy backhaul facilities are vital for the introduction of microcells to complement existing cell sites.

#### 4.1 Spectrum Available for Backhaul in Canada

With roughly 24 GHz of spectrum available in Canada for backhaul, wireless backhaul networks are designed employing a diverse range of frequency bands. The selection of a particular frequency band is primarily dependent on a variety of technical requirements (e.g. long-, medium- or short-haul capacity), design characteristics and operational practicalities. The following are the most frequently assigned frequency bands used for backhaul in Canada:

- **Lower 6 GHz: 5925-6425 MHz** (shared with fixed-satellite Earth-to-space on a primary basis);
- **Upper 6 GHz: 6425-6930 MHz** (shared with fixed-satellite Earth-to-space and/or space-to-Earth on a primary basis);
- **11 GHz: 10.7-11.7 GHz** (shared with fixed-satellite space-to-Earth on a primary basis);
- **15 GHz: 14.50-15.35 GHz** (shared with mobile, which is a primary/secondary service, 15.20-15.35 GHz is also allocated to the space research (passive) and Earth exploration–satellite (passive) services on a secondary basis);
- **18 GHz: 17.8-18.3 and 19.3-19.7 GHz** (shared with fixed-satellite space-to-Earth and/or Earth-to-space and/or meteorological-satellite service space-to-Earth on a primary basis); and
- **23 GHz: 21.8-22.4 and 23.0-23.6 GHz** (shared with fixed-satellite space-to-Earth on a primary basis)

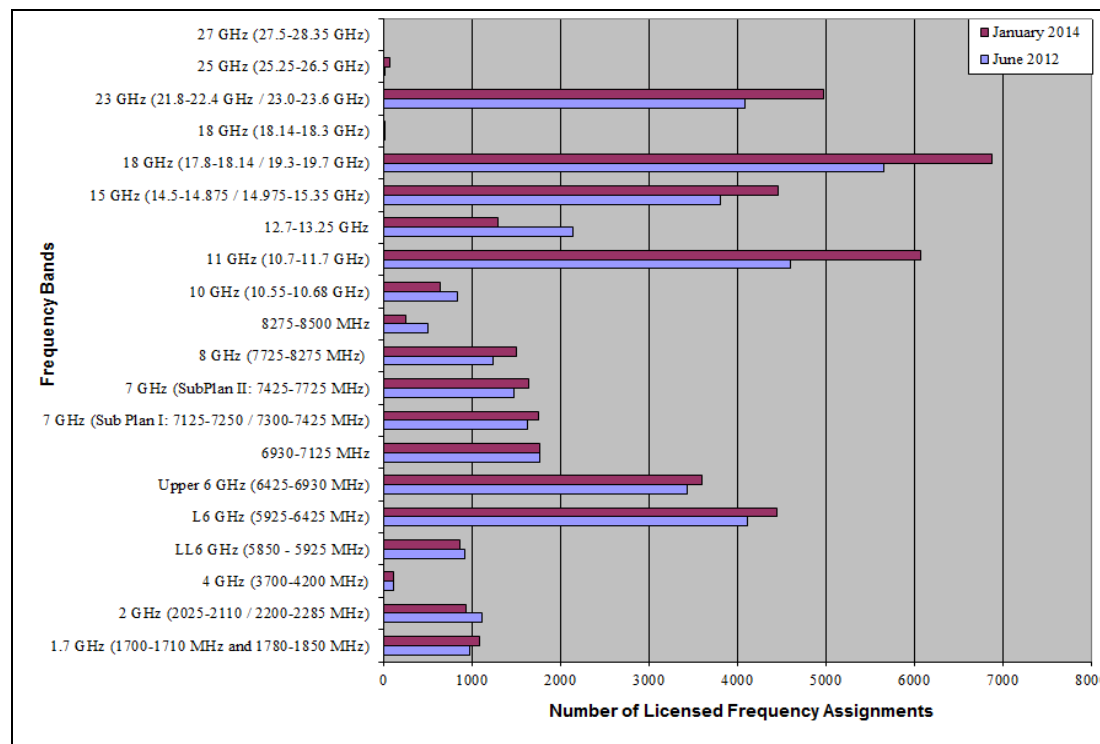
As detailed in Red Mobile's spectrum demand study,<sup>2</sup> although licensees are offloading traffic to fibre, the volume of traffic carried over microwave backhaul continues to increase and the demand for spectrum was "expected to grow from approximately 900 MHz in 2010 to between 2600 and 3400 MHz" by 2015. The study also noted that although there is currently more than 13 GHz of fixed service spectrum available within the 52 MHz to 38 GHz range, certain mid-range frequency bands (i.e. 11-23 GHz) are likely to experience greater demand. Metropolitan urban areas are currently

---

<sup>2</sup> [Study of Future Demand for Radio Spectrum in Canada 2011-2015](#). Red Mobile Consulting.

experiencing congestion within this frequency range, and even some rural locations along highway corridors have encountered coordination difficulties.

Since June 2012, wireless microwave licensing has continued at a steady pace across the majority of the backhaul frequency bands. Based on Industry Canada’s licensing records, the total number of links in Canada has grown by 10% over a 20-month period (June 2012 – January 2014). Furthermore, there is clear confirmation of a continued preference and usage of particular frequency bands, as demonstrated in Figure 1, where the use of the 11 GHz, 18 GHz and 23 GHz frequency bands has increased significantly between 2012 and 2014 (i.e. 31.8%, 21.7% and 21.7% respectively).



**Figure 1: Total number of fixed point-to-point microwave frequency assignments (record identifiers), per Industry Canada’s database (January 2014)**

Growing consumer demand for greater geographic coverage, faster data rates and more sophisticated applications are driving a rapid increase in the spectrum requirements for commercial mobile services. Notably, the number of subscriptions for commercial mobile services in Canada has more than tripled over the past decade, increasing by an average of 1.5 million per year.<sup>3</sup> This increase in mobile subscriptions has been accompanied by the adoption of more sophisticated mobile devices, such as smartphones and tablets, which provide access to the Internet. As Canadians rely more heavily on their smartphones and other mobile devices to access the Internet and data-intensive applications and insist on anytime and anywhere connectivity, sufficient backhaul capacity is required to accommodate this growth in traffic.

<sup>3</sup> Based on data from Canadian Wireless Telecommunications Association (CWTA) website and on *CRTC Communications Monitoring Report*, various years.

Not only is consumer behaviour driving the need for additional backhaul capacity, but as noted earlier, a broad range of industries and organizations also rely on fixed backhaul microwave systems for a host of applications. The current usage, technical requirements and forecasted needs provided by respondents have been summarized and grouped into three categories: wireless service providers; electrical utilities; and broadcasters.

## **4.2 Current Usage and Future Demand**

### **4.2.1 Wireless Service Providers**

Wireless service providers' microwave backhaul networks are typically designed using a range of frequency bands. The size and scale of these networks depend on the specific operator's business needs and service area. Some networks may consist of only a few links, whereas others comprise hundreds of links that span the entire country.

While there are a host of frequency bands allocated to the fixed service and available for backhaul, the following traditional bands were highlighted as being primarily utilized by wireless service providers in their networks:

- 4 GHz (3700-4200 MHz);
- Lower 6 GHz (5925-6425 MHz);
- Upper 6 GHz (6425-6930 MHz);
- 8 GHz (7725-8275 MHz);
- 11 GHz (10.7-11.7 GHz);
- 15 GHz (14.5-15.35 GHz);
- 18 GHz (17.8-18.3 GHz / 19.3-19.7 GHz);
- 23 GHz (21.8-22.4 GHz / 23.0-23.6 GHz); and
- 38 GHz (38.6-40 GHz).

The usage of the frequency bands identified above is not uniform across the country. Wireless service providers generally employ higher frequency bands for short-haul links within urban centres and use lower frequency bands, such as the 4 GHz and Upper / Lower 6 GHz, for long-haul deployments along highway corridors and outside of population centres. As such, the usage density varies widely according to location and frequency band.

Consumers' demands for faster broadband services, higher bandwidth applications, and connectivity anytime and everywhere have resulted in increased capacity demands on backhaul networks. As a result, backhaul capacities have steadily increased from tens to hundreds of Mbps; and capacities of up to 1 Gbps are anticipated by a few wireless service providers. To address the introduction of data-intensive applications and technologies, the rise of mobile subscription and data traffic, service providers are increasing the speed and capacity of their backhaul facilities.

Over the past several years, spectrum congestion has been experienced in many cities and communities across Canada. Congestion is caused by a variety of factors, including deployment intensity within a geographical area, as well as technical characteristics of the systems (e.g. antenna, power). Depending on the particular frequency band and deployment area, national wireless service providers signalled in their comments that they are experiencing congestion and that it is often difficult to coordinate a suitable

frequency. While some are facing congestion across all traditional backhaul frequency bands, others are primarily encountering difficulties within the Lower and Upper 6 GHz bands in rural areas and within mid-range frequency bands (i.e. 11 GHz, 15 GHz, 18 GHz and 23 GHz) in urban and surrounding centres, including Vancouver, Montréal, Quebec City and Southern Ontario.

The majority of responding wireless service providers urged the Department to provide immediate access to additional backhaul spectrum across all frequency ranges to support fixed and mobile broadband services. In an effort to meet the increased demand and capacity, wireless service providers are actively deploying new links and upgrading their networks with state-of-the-art technologies. Notwithstanding the use of new technologies, they foresee the need for additional medium- and long-haul spectrum to extend and upgrade deployment and services in rural and remote areas and short-haul spectrum for high-capacity links to aid in densification within urban areas. Shaw specifically noted that it is imperative that sufficient spectrum be available to bring broadband access to more remote areas. ABC Communications also supports the need for more spectrum and expects to double or triple its usage of licensed links in the next three to five years.

In addition to the continuing requirement and use of traditional backhaul frequency bands, wireless service providers indicated their interest in deploying short-haul links within the 71-76 GHz and 81-86 GHz frequency bands to support broadband applications.

#### **4.2.2 Electrical Utilities**

Electrical utilities, electricity generation, transmission and distribution companies on a city-wide, regional and provincial basis own and operate wireless infrastructure across Canada. Reliable communication and telecommunication systems are essential in the monitoring and control of the electrical grid and delivery of electricity services to the public. Over the past few years, electrical utilities have begun modernizing their distribution, generation and transmission systems to address increasing demand and new electricity generation resources. Moreover, robust and reliable communication applications and services, including smart metering, smart grid automation and diversion detection of the overall power grid, monitoring, control and protection of the power system, support the modernization of the power system and delivery of electricity.

Through legislated mandates, electrical companies are required to provide service to both urban and remote areas. Moreover, they must also comply with provincial regulations and international reliability agreements. To meet their regulatory reliability requirements, electrical utilities employ various redundancy and diversity techniques, which have traditionally included hot standby and frequency diversity.

Electrical utility companies continue to deploy long- and medium-haul backhaul links, primarily using the 7 GHz band, given its propagation characteristics. As their networks grow and service is extended, they are increasingly relying on other frequency bands. As electrical utilities are also deploying and expanding their smart metering and smart grid systems, the use of the frequency range 1800-1830 MHz within the 1.8 GHz band is considered ideal for distribution and local, point-to-multipoint access networks. Additionally, electrical utility companies make use of licence-exempt spectrum for non-critical systems where reliability is not an issue, along with public carrier networks for corporate and administrative traffic not related to power system operations.



The Canadian Electricity Association (CEA) provided the following table, summarizing the spectrum usage and trends of several Canadian electric and power utilities, noting the increased reliance on the 1.8 GHz and 7 GHz bands.

**Table 1: Canadian electric and power utility spectrum usage (links) and trends**

Band	Altalink	BC Hydro	Sask Power (n2)	Hydro One	Hydro Quebec	Manitoba Hydro	Nova Scotia Power	Avg. Path Length	Capacity
932 MHz	55 (dec)	20 (sta)	7 (inc)		33	2 (sta)	25 (inc)	25 km	384 kbps or 768 kbps
1.5 GHz					11 (dec)				Analog
1815 MHz		540 (inc)	2	40 (inc)	30 (inc)	20 (inc)	10 (inc)	10 km	1.54 Mbps to 5.76 Mbps
1.7-1.9 GHz					(dec)	1 (dec)			Analog
1.9-2.3 GHz					(dec)				Digital
2.3-2.5 GHz					(dec)	2 (sta)			4x8xDS1 to 8xDS1
3650 MHz		10 (inc)	1						12 Mbps
6 GHz					6 (sta)	4 (sta)			16xDS1 to OC3
7 GHz	200 (inc)	198 (inc)		42 (inc)	380 (sta)	106 (inc)	53 (inc)	40 km	OC3
8 GHz	20 (inc)	18 (inc)			50 (sta)			40 km	OC3
10 GHz									4xDS1 to OC3
11 GHz	12 (inc)	40 (inc)			15 (dec)			10 km	4xDS1 to OC3
15 GHz	26 (dec)			1				15 km (n1)	
18 GHz		3 (sta)		8 (inc)					

*notes*

(inc) = increasing use

(dec) = decreasing use

(sta) = stable, i.e. not increasing or decreasing

(n1) Altalink notes that the paths are longer than the industry average, and plans to move to lower frequencies

(n2) SaskPower has fibre optic cable to 75% of its substations

To meet the growing electricity requirements, BC Hydro, like all electrical utilities, is forecasting the need for new and upgraded capacity on existing routes, extending the breadth of the SCADA system and smart grid. The electrical utilities anticipate that they will be able to address these needs over the next five years, primarily through the continued use of the 1.8 GHz and 7 GHz bands, but foresee the need to also rely on other bands as well, to accommodate increases in capacity and new deployments.

**4.2.3 Broadcasters**

Backhaul is used to support broadcasting undertakings through applications such as electronic news gathering (ENG), TV pick-up, studio-transmitter links (STL) and cable distribution through Very High Capacity Microwave (VHCM) facilities. While the first of these applications is transportable and therefore naturally wireless given its mobility needs, the others are more versatile and rely on varied backhaul solutions.

Significant corporate (i.e. vertical integration) changes have transformed the traditional broadcasting industry. Some broadcasters now provide consumers with multiple services, such as direct-to-home television, high-speed Internet, telephone and/or telecommunications services.

CBC/Radio-Canada noted in its comments the use of the 400-500 MHz, 930-960 MHz, 1.7 GHz, 2 GHz, 6 GHz, 13 GHz, and 23 GHz frequency bands for the provision of diverse broadcast services. It noted that broadcasters are experiencing congestion primarily within the 2 GHz (2025-2110 MHz portion) and 6 GHz bands in large urban markets (e.g. Toronto, Montréal, Vancouver and Winnipeg). With multiple broadcasters converging on scene of breaking news, CBC/Radio-Canada stressed a spectrum shortage for mobile applications, such as TV pick-up channels, within the band 2025 MHz to 2110 MHz. Coordination is not viewed as an effective means to mitigate congestion, as these deployments are generally unplanned and for a relatively short time frame. Given the competitive broadcast news market, the ability to rapidly respond to breaking news events, which can happen anytime and anywhere, is essential.

With the requirement for good propagation (high reflection and diffraction), CBC/Radio-Canada does not envision using frequency bands higher than 2 GHz for ENG or TV pick-up operations.

## **5.0 Consideration of Specific Frequency Bands**

Spectrum use evolves with changing technology and service requirements. As part of Industry Canada's mandate to effectively manage spectrum in Canada, and in an effort to respond to new demands regarding radio spectrum, the Department has taken into consideration the responses provided in assessing both traditional and potential new frequency bands for backhaul purposes. Respondents identified challenges in meeting growing backhaul requirements with respect to available backhaul spectrum. While the introduction of more spectrally efficient equipment and the ability to offload traffic onto fibre networks will continue to address some of these issues, wireless service providers, electrical utilities and broadcasters have expressed a need for additional backhaul spectrum to meet their growing needs.

In the consultation, the Department identified potential frequency bands for backhaul, as well as bands that although already identified for this purpose, were currently underutilized. The following sections outline the Department's decisions on utilization and technical requirements related to backhaul spectrum, including methods to increase utilization and the retention of existing and/or introduction of new applications within specific frequency bands.

### **5.1 Underutilized Spectrum**

The Department assesses the utilization of designated spectrum resources to ensure the efficient implementation of existing and emerging new technologies or services. Although technical, social, cultural and regulatory factors may influence the designation of a service or application within a particular frequency band, they do not guarantee the spectrum's maximum utilization. As spectrum is a finite resource, its efficient use is paramount.

The Department recognizes that some frequency bands used for backhaul are underutilized and consulted on whether there was any renewed interest in these bands for backhaul and, if so, whether there were proposals to improve their usage. Respondents noted that limited deployment can be the result of a variety of factors, including a lack of harmonization that leads to an immature ecosystem and a lack of available equipment, sharing or domestic / international coordination issues and national regulatory provisions.

The following frequency bands, or portions thereof, were identified in the consultation as being underutilized: 4 GHz band (3700-4200 MHz); 18 GHz band (17.8-18.3 GHz and 19.3-19.7 GHz); and 24 GHz, 28 GHz and 38 GHz.

### **5.1.1 4 GHz Band (3700-4200 MHz)**

The [\*Canadian Table of Frequency Allocations\*](#) includes a co-primary allocation to the fixed service (FS) in the 3700-4200 MHz band, as well as to the fixed-satellite service (FSS).

The 4 GHz band was previously used extensively by the FS for high-capacity microwave systems, forming part of the backbone of the Canadian telecommunications network. Microwave use of the band has been decreasing over the past decade, in favour of national fibre networks. With fewer than 60 links Canada-wide, the Department questioned whether there was still interest in the band for the deployment of new heavy route backhaul systems.

In their responses, several wireless service providers expressed a renewed interest in the band given its propagation characteristics and cited it as an attractive option for high-capacity, long-haul systems, especially as an alternative to the congested Lower and Upper 6 GHz bands (5925-6425 MHz and 6425-6930 MHz). Both Rogers and TELUS noted their interest in taking advantage of the 4 GHz spectrum for heavy route backhaul systems. Others, such as SaskTel and Vidéotron, indicated that they have no plans to utilize the band in the near term.

Although the band may not be heavily used by the FS community, it is being used by the FSS. In particular, CBC/Radio-Canada views this band as mission critical for its FSS operations. It commented that the band is used extensively by C-band FSS receive-only systems to receive program feeds, and cited the hundreds of C-band FSS receive-only antennas across the country which are required to receive program feeds from their two main production centres (Montréal and Toronto) at their transmission sites. In addition to FSS receive-only systems, other satellite systems use the band for a host of applications, including the delivery of broadband communications in the Arctic and in remote areas.

As international discussions regarding the potential for mobile use in the 3400-3800 MHz range continue, several respondents contend that this issue should first be addressed prior to any decisions regarding possible changes to the band. The RABC indicated in its response that there are interests in using the band between 3400-3800 MHz for mobile/fixed communications networks, including International Mobile Telecommunications (IMT), and noted that the Third Generation Partnership Project (3GPP) has developed standards for band 22 (frequency division duplexing (FDD)),<sup>4</sup> band 42

---

<sup>4</sup> Band 22: 3410-3490 MHz uplink/3510-3590 MHz downlink

(time division duplexing (TDD))<sup>5</sup> and band 43 (TDD).<sup>6</sup> Furthermore, TELUS, Bell Mobility and Rogers encouraged the Department to refrain from making any decisions relating to the use of the 3700-3800 MHz portion of the band until the Department had concluded consultations on allocations within the 3.5 GHz band. Moreover, TELUS contends that a moratorium should be placed on any new licensing within the frequency range 3700-3800 MHz.

Apart from the international uncertainty of the 3.5 GHz band, the lack of new FS deployments was also attributed to limited availability of modern equipment by some respondents. It was further noted that this lack of interest by equipment manufacturers and wireless service providers could be the result of non-harmonized technical requirements<sup>7</sup> of the band. AVIAT suggested that technical standards be aligned with the United States to provide the necessary market scale in order to develop usage of this band in Canada and Shaw noted that there is very limited equipment availability for this frequency band.

Several technical provisions were proposed to improve FS usage within the band. These included adopting a single common duplex spacing to ease frequency coordination and channel growth; aligning more closely with the United States to benefit from a larger ecosystem; increasing flexibility of use by accommodating medium-capacity in addition to the current high-capacity only point-to-point fixed service systems; and developing new FS / FSS coordination policies.

The Department acknowledges the important role that lower frequency backhaul bands play in supporting rural deployments given the long distances between populated areas. With the introduction of commercial mobile broadband services in the 700 MHz band and the transition of cellular to Long Term Evolution (LTE), high-capacity backhaul systems to support these services are crucial.

Use of the 4 GHz band by the FS is currently limited to high-capacity systems. Loosening this restriction would allow the deployment of systems that may not initially transmit large volumes of data, but would likely over time increase the amount of capacity being carried. For example, this additional flexibility becomes increasingly important in the development of microwave backhaul systems supporting services in rural areas where there may not be sufficient traffic over the link to initially qualify it as a high-capacity link. Rather than not permitting these links due to limited capacity, the Department would allow them to operate under the provision that they will eventually carry more traffic as additional services are delivered to the communities. To increase overall usage and flexibility, the Department will loosen the capacity restriction in the upper portion of the band (i.e. 3800-4200 MHz), by permitting systems with lower capacities to operate within the band. The specific traffic throughput requirements will be outlined as part of the technical rules established by the Department. By solely concentrating on the upper portion of the band, any influx of systems will not detract from international mobile discussions within the 3400-3800 MHz frequency range.

---

<sup>5</sup> Band 42: 3400-3600 MHz

<sup>6</sup> Band 43: 3600-3800 MHz

<sup>7</sup> Industry Canada adopted 20, 30 and 40 MHz channels with duplex spacings of 250 MHz, 255 MHz, and 260 MHz respectively, compared to the FCC, which adopted 20 MHz maximum authorized bandwidth channels with a duplex spacing of 40 MHz.

Furthermore, current microwave radio equipment provides for easily scalable transmission capacities. As such, it is relatively straightforward to expand a system to accommodate additional traffic as the network grows. This allows for the orderly progression in upgrading traffic throughput and is advantageous in that no new infrastructure is required, as the systems are able to continue using the same spectrum range to accommodate traffic increases.

Given the international interest in mobility within the band 3400-3800 MHz and ongoing international discussions regarding the lower portion of the 4 GHz band (3700-3800 MHz), the Department will continue to monitor global spectrum policies regarding the 3400-3800 MHz frequency range and will review the spectrum utilization policy and associated technical standard as needed in the future. As the consultation proposed no changes to the status of FSS in this band, the Department reiterates that the band is shared between co-primary FS and FSS (space-to-Earth) systems on a coordinated first-come, first-served (FCFS) basis, with responsibilities for protection placed on both parties in the coordination process.<sup>8</sup>

**Decision:**

**The Department is loosening the capacity restriction on fixed service (FS) systems operating within the upper portion of the band (i.e. 3800-4200 MHz). Systems with lower traffic throughput will be permitted provided that they conform with the technical rules of the frequency band.**

### 5.1.2 18 GHz Band (17.8-18.3 GHz and 19.3-19.7 GHz)

The [Canadian Table of Frequency Allocations](#) includes a primary allocation to the FS in the bands 17.8-18.3 GHz and 19.3-19.7 GHz and a corresponding Canadian domestic footnote C16D,<sup>9</sup> specifying that the FS has priority over the use of the FSS. Furthermore, use of the spectrum for FSS is limited to applications that pose minimal constraints on the deployment of fixed services. The band is also allocated to other services on a co-primary basis, with use of the FSS having priority over use of the FS within the 18.3-19.3 GHz range.

The Department, through [Revisions to Spectrum Utilization Policies in the 3-30 GHz Frequency Range and Further Consultation](#), made significant changes to the 18 GHz band from a fixed services perspective: placing a moratorium on the licensing of new fixed systems in the bands 17.7-17.8 GHz and

<sup>8</sup> See SRSP-303.7, *Technical Requirements for Fixed Line-of-Sight Radio Systems Operating in the Band 3700-4200 MHz*. As guidance, to protect against geostationary-satellite space station emissions, new fixed service station receive antennas in the band 3700-4200 MHz should avoid pointing towards the geostationary-satellite orbit, taking into account the effect of atmospheric refraction. As a condition for band sharing with terrestrial services in the band 3700-4200 MHz, ITU Radio Regulation **RR 21** specifies the power flux-density limits at the Earth's surface of space station emissions of the fixed-satellite service.

<sup>9</sup> **C16D (CAN-05)** In the bands 17.8-18.3 GHz and 19.3-19.7 GHz, the use of spectrum for the fixed service has priority over the use of the fixed-satellite service. Use of the spectrum for fixed-satellite service shall be limited to applications that pose minimal constraints on the deployment of fixed services. Earth stations that comply with these requirements will be coordinated and may be granted radio authorization on a case-by-case basis.

18.3-19.3 GHz, as well as restructuring portions of the pairings within the bands 17.8-18.3 GHz and 19.3-19.7 GHz. This resulted in a uniquely Canadian band plan, differing significantly from that of the United States and European Telecommunications Standards Institute (ETSI) in terms of duplex spacing and/or channel bandwidths.<sup>10</sup> This has curtailed licensing activity in the bands 18.14-18.3 GHz and 19.3-19.36 GHz (10 assignments). This is in stark comparison to the more than 6,500 FS licensed frequency assignments in the paired bands 17.8-18.14 GHz and 19.36-19.7 GHz.

Given the lack of deployments within the bands 18.14-18.3 GHz and 19.3-19.36 GHz, the Department sought comments from industry on proposals to increase the utilization of the sub-bands.

The RABC, Bell Mobility, Rogers, TeraGo and AVIAT all contend that the low usage of the 18.14-18.3 GHz and 19.3-19.36 GHz portions of the band stem from its fragmented nature and non-standard duplex spacing (i.e. 1160 MHz), which have resulted in limited usage opportunities for wireless service providers and in a partial market for manufacturers. These points are further stressed by Rogers, which has confirmed with certain manufacturers that there is no equipment available and there are no plans for any product development in these portions of the band. It was further noted that given the overall asymmetry of this sub-band, only two 30 MHz paired channels and a single 100 MHz unpaired block are permitted.

To specifically increase the utilization of these portions for backhaul, the RABC, TeraGo, Bell Mobility and Rogers encouraged the Department to explore the suitability of TDD applications. TeraGo also recommended that the Department retain the existing designation in preference for applications requiring low-capacity systems in small channel bandwidths and allow for more flexible use of the spectrum by including point-to-multipoint applications.

Given that the frequency bands 17.8-18.3 GHz and 19.3-19.7 GHz are adjacent to spectrum which is allocated on a primary basis to the FSS (space-to-Earth) and to FSS feeder links for mobile-satellite service (MSS), EchoStar raised concerns about adjacent band effects to Earth station receivers should the Department relax antenna requirements. As such, EchoStar requested that smaller antennas be prohibited in adjacent channels and that coordination be required for all FS stations using any part of the adjacent band with FSS gateway stations operating within the bands 18.3-19.3 GHz or 19.7-20.2 GHz.

Based on the submissions, there was considerable support for a further review of the feasibility of TDD operations within the band. In support of technology-neutral use in general and to specifically increase use within 18.14-18.3 GHz and 19.3-19.36 GHz, the Department will consider TDD systems within this portion of the band; however, these systems would be expected to operate within the envelope of technical rules already established within SRSP-317.8.<sup>11</sup> While this will not specifically address the unique channelling plan resulting from previous decisions on designating the FSS priority use in the band 18.3-19.3 GHz, it will allow and encourage additional usage. The Department will establish

---

<sup>10</sup> The FCC has a channeling plan with similar channel bandwidths (i.e. 2.5 MHz, 5 MHz, 10 MHz, 20 MHz, 30 MHz, 40 MHz and 50 MHz) and duplex spacing (i.e. 1560 MHz) for point-to-point two-way systems (primary), but an offset frequency range (e.g. 17740-18140 MHz and 19300-19700 MHz), whereas the ETSI channel plan makes use of different channel sizes (e.g. 220 MHz, 110 MHz, 55 MHz and 27.5 MHz) and duplex spacing (i.e. 1010 MHz).

<sup>11</sup> *SRSP-317.8 — [Technical Requirements for Fixed Line-of-Sight Radio Systems Operating in the Bands 17.8-18.3 GHz and 19.3-19.7 GHz.](#)*

specific technical rules for the 18.14-18.3 GHz and 19.3-19.36 GHz portions of the band, in consultation with the RABC.

**Decision:**

**With respect to the fixed service allocation, the Department is maintaining the designation of spectrum for point-to-point applications in the paired bands 17.8-18.3 GHz and 19.3-19.7 GHz.**

**5.1.3 24 GHz, 28 GHz and 38 GHz Bands**

The 24 GHz (24.25-24.45 GHz and 25.05-25.25 GHz) and 38 GHz (38.6-40 GHz) frequency bands are designated for use by digital systems in the FS for broadband wireless applications, including point-to-point and/or point-to-multipoint systems. The 28 GHz frequency band (25.25-26.5 GHz and 27.5-28.35 GHz) is designated for use by line-of-sight radio systems in the FS, including point-to-point and point-to-multipoint systems. It should be noted that the other services share these bands on a co-primary and/or secondary basis in accordance with the [Canadian Table of Frequency Allocations](#) and spectrum utilization policies.

In 1999, the Department auctioned spectrum in the 24 and 38 GHz bands for point-to-point and point-to-multipoint broadband wireless access applications. A total of 400 MHz (24.25-24.45/25.05-25.25 GHz) of spectrum was made available in the 24 GHz band and a total of 800 MHz (38.7-39.1/39.4-39.8 GHz) was made available in the 38 GHz band, as per Table 2. Since then, there has been limited usage by FS systems within the auctioned spectrum.

**Table 2: The 24 and 38 GHz auctioned spectrum blocks**

Spectrum Licence	Size (MHz)	Lower Frequency (MHz)	Upper Frequency (MHz)
A	200 + 200	24,250-24,450	25,050-25,250
B	200 + 200	38,700-38,900	39,400-39,600
C	50 + 50	38,900-38,950	39,600-39,650
D	50 + 50	38,950-39,000	39,650-39,700
E	50 + 50	39,000-39,050	39,700-39,750
F	50 + 50	39,050-39,100	39,750-39,800

The non-auctioned portions of the 38 GHz band have been available for licensing point-to-point and/or point-to-multipoint systems on an FCFS basis since 1996. The 38 GHz band is primarily used for short-distance backhaul in urban core areas. Although more interest and deployments have occurred within the paired FCFS portion (38.6-38.7 GHz, 39.1-39.4 GHz and 39.8-40.0 GHz), as per licensing records within Industry Canada’s Assignment and Licensing System (ALS) database and Spectrum Direct, the unpaired 38.4-38.6 GHz portion has seen little deployment.

Following limited deployment of 28 GHz band Local Multipoint Communication Systems (LMCS), all licences were eventually returned to Industry Canada by January 2002. In June 2011, the Department

released a spectrum utilization policy, which addressed the implementation of fixed radio systems in the bands 25.25-26.50 GHz and 27.50-28.35 GHz, and made the bands available for licensing for point-to-point and point-to-multipoint applications on an FCFS basis. According to Industry Canada's records, there is currently one licensee in these bands with 44 links that are radio licensed.

In response to the backhaul consultation, the RABC proposed that Industry Canada facilitate access to unassigned or returned frequency blocks in the 24 and 38 GHz bands on an FCFS basis for backhaul. The RABC also indicated that availability both on a spectrum and area basis for the 24, 28 and 38 GHz bands would greatly assist access.

In its response, TELUS stated that the 38 GHz band has significant spectrum that could be used for short urban backhaul. TELUS also suggested that the fragmented licensing approach between FCFS and auctioned spectrum makes it difficult to use this band as a fibre alternative in urban areas (i.e. requiring paired blocks larger than 50 MHz). To this end, TELUS recommended that the Department modify the current 38 GHz policy to address all unused spectrum (both from the non-auctioned and the auctioned portions of the band) in an attempt to increase channel sizes. TELUS recommended that the Department address this in the coming year to facilitate the use of this band for backhaul in support of mobile and fixed broadband services. Bell also suggested that the overall structure of the 38 GHz band plan be reviewed to address the issue of unused / returned spectrum and fragmented licensing approach (FCFS/auctioned) in an effort to facilitate applications with channel bandwidths in excess of 50 MHz.

In addition, the RABC and Bell Mobility recommended that the Department update the availability of the 24 and 38 GHz unassigned and returned blocks on the website, citing that up-to-date spectrum availability would assist interested licensees in taking advantage of this spectrum and facilitate its use.

The Department recently launched a consultation, SLPB-003-14, *Consultation on a New Licensing Framework and Licence Renewal Process for the 24, 28 and 38 GHz Bands*,<sup>12</sup> which sets out Industry Canada's proposals with respect to a new licensing process for licences in the 24, 28 and 38 GHz bands, as well as technical data requirements. The decision related to these issues will be announced as a part of that separate consultation process.

Similar to the auctioned spectrum, the lower 200 MHz portion of the 38 GHz band (38.4-38.6 GHz) has had little deployment. As such, the Department used the consultation as a mechanism to explore and address the lack of use within the sub-band. In the responses to the consultation, most respondents attributed the lack of deployment and use of the 38.4-38.6 GHz portion of the band to a lack of commercial equipment, whereas TELUS noted that this was likely due to the one-way (unpaired) requirement and a channel bandwidth too small for FDD duplexing. This notion was furthered by AVIAT, a manufacturer, which commented that the band is too small to support the necessary duplex spacing for FDD systems. Furthermore, the RABC, in its discussions with equipment vendors, noted that they were not aware of any plans for the development of equipment in this band.

---

<sup>12</sup> For details, see SLPB-003-14, *Consultation on a New Licensing Framework and Licence Renewal Process for the 24, 28 and 38 GHz*, at <http://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf10829.html> June 2014.



A few proposals were suggested by respondents to make better use of the band. Both Rogers and AVIAT suggested that given the small segment size and unpaired channelling, permitting two-way TDD systems within the 200 MHz may be a viable solution.

Industry Canada recognizes the need to examine the technical rules for the 38 GHz band. Following the decisions on the 24, 28 and 38 GHz consultation, the Department will consult with the RABC on revisions to SRSP-338.6, to address the issues raised in the backhaul consultation, including a TDD portion within the lower 200 MHz portion of the 38 GHz band (38.4-38.6 GHz). The Department will make any necessary revisions to associated publications, such as the standard radio system plan and spectrum utilization policy.

## **5.2 Provision of Additional Two-Way Backhaul Spectrum**

Industry Canada is committed to ensuring the orderly development and efficient operation of radiocommunications in Canada. This includes providing sufficient spectrum to support the development of new and innovative applications and services. As such, the Department is making additional spectrum available for wireless backhaul across medium- and short-haul frequency bands. By ensuring sufficient and harmonized spectrum, the Department is facilitating the deployment of broadband infrastructure, especially in rural areas. In these endeavors, the Department recognizes the importance of aligning spectrum use and designations within the global marketplace, to the greatest extent possible.

### **5.2.1 13 GHz (12.7-13.25 GHz)**

The 13 GHz band is shared on a co-primary basis between the FS and the FSS (Earth-to-space). Use of the FSS is in accordance with the International Telecommunication Union's (ITU) *Appendix 30B — Provisions and associated Plan for the fixed-satellite service in the frequency bands 4 500-4 800 MHz, 6 725-7 025 MHz, 10.70-10.95 GHz, 11.2-11.45 GHz and 12.75-13.25 GHz.*<sup>13</sup> Use of the bands 13.0-13.15 GHz and 13.2-13.25 GHz in the Earth-to-space direction by the FSS includes feeder links for mobile-satellite space stations.

Canada currently has access to four geostationary orbital positions using the band 12.75-13.25 GHz. Three orbit positions are assigned for feeder links and Telemetry, Telecommand and Control (TT&C) operations, in support of Canadian mobile satellite. The remaining orbital position is available for assignment to Canadian satellite operators. TerreStar Canada and SkyTerra Canada operate feeder link and TT&C Earth stations in the bands 12.75-13.25 GHz (Earth-to-space), as well as 10.7-10.95 GHz and 11.2-11.45 GHz (space-to-Earth). Such feeder link and TT&C operations involve gateway Earth stations, which are currently located in Ottawa and Allan Park, Ontario, and Saskatoon, Saskatchewan.

---

<sup>13</sup> FINAL ACTS WRC-12 WORLD RADIOCOMMUNICATION CONFERENCE (GENEVA, 2012)  
<http://www.lvm.fi/lvm-mahti-portlet/download?did=81247>

With respect to the FS, the 12.7-13.2 GHz portion is utilized by a variety of applications, including VHCM systems, TV STLs, and TV pick-up, which shares a portion of the band (13.15-13.25 GHz) on a case-by-case basis in certain geographic areas. Typically, VHCM systems use the entire 12.7-13.2 GHz band to deliver cable programming from the main cable head-end to cable distribution points in adjacent towns and communities (primarily in rural and remote areas). TV pick-up operations, including ENG, are generally licensed on a geographical basis over a defined area, within the 13.20-13.25 GHz portion of the band.

Given the interest and spectrum demand to deploy medium-haul systems, as well as the limited requests for additional VHCM systems, the Department proposed, in the consultation, to introduce fixed two-way low-, medium- and high-capacity point-to-point backhaul services in the band 12.7-13.2 GHz, on a coordinated basis, with the FSS and the existing FS (point-to-multipoint VHCM and TV pick-up systems).

There was strong support from wireless service providers for the introduction of two-way backhaul applications in the band. In general, they voiced a need for additional mid-range backhaul spectrum as soon as possible, citing the Department's reallocation of 570 MHz of spectrum within the 11 and 15 GHz bands to other uses. As a result of the moderate to heavy usage within mid-range spectrum, coupled with the recent loss of the above-noted spectrum, service providers indicated that geographical areas are becoming highly congested. Mobilicity supported the Department's proposal, as it would likely relieve congestion that Mobilicity is experiencing in the 15 GHz band in urban areas, including Vancouver. This sentiment was reiterated by Québecor Média, which also noted in its comments that this is an appropriate alternative to the congested 11 GHz, 15 GHz and 18 GHz frequency bands for medium-haul routes.

There was general consensus that, through appropriate coordination with existing broadcast (TV pick-up, ENG and VHCM) and FSS systems, the introduction of backhaul into the band would be feasible. TELUS recommended coordination on a geographic basis with existing FS and FSS deployments given that TV pick-up and ENG operations are primarily within urban centres and the limited FSS usage to date. Although the RABC noted a significant move towards utilization of the 12.75-13.25 GHz frequency band for the provision of various FSS services, such as VSAT, TV video services and broadband services, which could result in additional FSS uplinks in Canada.

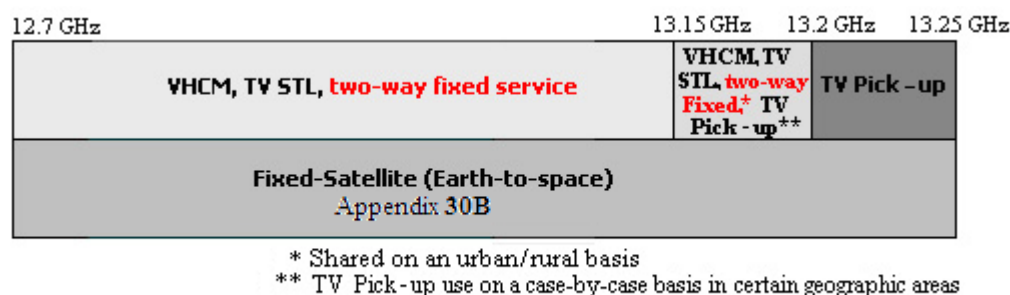
Recognizing that such use would require full band and full arc coordination in the areas around the current and possible future TerreStar and SkyTerra Canada Earth stations, the RABC suggested that the coordinated usage of operations and possible exclusion zones be considered with respect to feeder link and TT&C Earth stations, which transmit very small carriers to the satellite and receive very weak signals from satellites. However, the Department notes that narrow bandwidths characteristics of TT&C Earth stations are not representative of typical FSS systems.

Although broadcasters expressed a continued need for VHCM systems and TV pick-up operations, they were satisfied that, through coordination on a geographic basis, backhaul systems could be accommodated within the band, but particular attention to TV pick-ups operating within the 13.15-13.25 GHz portion of the band would be required. Furthermore, Shaw suggested that the 13 GHz band remain designated for VHCM, on a primary basis, with the introduction of backhaul applications on a secondary basis. The Department notes that although there has been a trend toward fibre, some

cable carriers continue to expand into smaller remote communities where VHCM systems may be their sole option. Shaw supports the coexistence of a variety of systems on a coordinated basis.

Various respondents, including the RABC, TELUS and AVIAT, supported the introduction of two-way backhaul applications in the band, and recommended aligning the band and technical standards<sup>14</sup> with the United States, noting that the FCC recently adopted rules that permit fixed microwave operations to share the 13 GHz band with TV pick-up services. TELUS also pointed out that should the Department align this band with the United States, there would be 100 MHz of remaining unpaired spectrum available for TV pick-up and ENG applications. Shaw noted the existence of an ETSI band plan and recommended channel sizes of 20, 30, 40 and 50 MHz to ensure the maximum bandwidth capacity of the microwave links, whereas Rogers suggested a similar channel plan, but with the inclusion of 10 MHz channels. Both contend that this large variety of channel widths and the possibility of aggregation allows for greater flexibility in the deployment of low-, medium- and high-capacity systems, noting that equipment is available and in use in Europe.

There has been a wide range of support and spectrum demand for medium-haul systems. The Department notes that various geographical areas within the 11-15 GHz frequency band range are becoming congested, requiring the implementation of enhanced technical standards. To address the moderate to heavy usage within the 11-15 GHz frequency range, coupled with the reallocation and redesignation of 567 MHz spectrum within this range, the Department will introduce fixed two-way point-to-point backhaul services in the band 12.7-13.2 GHz, on a coordinated basis, with the FSS and the FS (point-to-multipoint VHCM and TV pick-up), as per Figure 2.



**Figure 2: Introduction of two-way fixed service in the 13 GHz band**

The Department notes that the FCC has revised its technical rules to allow fixed microwave operations within the 13 GHz band. There are direct benefits in harmonized usage, which include ease of international coordination, economies of scale and equipment ecosystems.

Industry Canada recognizes that TV pick-up operations are primarily located in metropolitan, densely populated urban areas. Given the transportable nature and “anytime” operation of these systems, the need for excessive coordination and the potential for interference would most likely occur in these urban

<sup>14</sup> Channel bandwidths of 12.5 MHz, 25 MHz and 50 MHz; duplex spacing 225 MHz; maximum frequency tolerance of 0.005%; and maximum transmitter power of +50 dBW – [AVIAT Networks](#) response to “*Consultation on Spectrum Utilization Policies and Technical Requirements Related to Backhaul Spectrum in Various Bands, Including Bands Shared With Satellite, Mobile and Other Services,*” SMSE-018-12.

areas. However, outside of urban areas, it is conceivable that through appropriate coordination, two-way fixed point-to-point systems can share the 13.15-13.2 GHz portion of the band with existing operations. As such, the Department will allow the 13.15-13.2 GHz portion of the band to be shared on a geographical basis.

In major metropolitan and urban areas (e.g. Toronto, Montréal and Vancouver), preference would be given to TV-STL and TV pick-up systems, whereas outside of these areas, two-way point-to-point systems would be afforded access. Access to these “priority” areas would be at the discretion of Industry Canada’s regional and district directors.

Industry Canada is cognizant of existing FSS systems within the band and its obligation to protect FSS allotments. As there is currently demand for point-to-point backhaul systems, the Department will permit their introduction into the frequency band 12.7-13.2 GHz, noting that the fixed service and FSS stations are to continue to coordinate on an FCFS basis. Furthermore, use of these stations must be coordinated in advance to avoid harmful interference. The Department will identify technical requirements, including specific coordination and sharing considerations with FS and FSS, through the revision of the applicable Standard Radio System Plan (SRSP-312.7), in consultation with the RABC.

**Decision:**

**The Department will allow fixed two-way point-to-point radio systems to be deployed in the frequency band 12.7-13.2 GHz, providing that existing VHCM, TV STL, TV pick-up operations and FSS systems are protected. Specific details, including sharing and protection criteria, will be established during the revision of SRSP 312.7. Two-way fixed point-to-point systems may access the 13.15-13.2 GHz portion outside of urban areas (sharing on a geographical basis).**

Although there was general support for a moratorium on the licensing of VHCM systems, it was not unanimous. While some respondents simply had no objection or no opinion on the issue, others cited the underutilization of the band by VHCM systems across the country and the requirement to ensure adequate spectrum for new backhaul systems to support mobile broadband services as reasons for supporting the moratorium. Conversely, Shaw objected to the moratorium, citing the need for cable systems to reach small, remote communities, noting that these communities are often in mountainous or coastal regions but can also be found in the newer “bedroom” communities developed outside major centres that have no existing communication infrastructure. There continue to be several instances where cable carriers have no option but to provide broadcasting services to smaller communities using VHCM systems where installation of fibre facilities is neither technically nor economically feasible. Shaw proposed that the band retain its primary designation for VHCM, but that backhaul applications be permitted on a secondary basis.

Given that there has been limited licensing activity for VHCM systems in the past few years and that the majority of licensed systems are in rural areas, the Department does not see a concern with the introduction of a moratorium on new VHCM systems. However, it does recognize that fibre is not always a viable option for cable companies that provide and expand their service into rural and remote areas. Operators may continue to deploy and expand their VHCM networks in rural and remote areas

where, at the discretion of the regional and district directors, there is no demand for fixed two-way point-to-point radio.

**Decision:**

**The Department is issuing a moratorium on licensing new VHCM systems in the frequency band 12.7-13.2 GHz in urban areas. Modifications to existing VHCM systems which can be coordinated may be authorized on a case-by-case basis.**

**The Department will continue to allow the deployment and expansion of VHCM systems outside of urban areas.**

### 5.2.2 31.8-33.4 GHz

The 32 GHz band (31.8-33.4 GHz) was allocated worldwide, apart from in the United States, on a primary basis for the FS at the 2000 World Radiocommunication Conference (WRC-2000). Although shared with other services on a co-primary basis in accordance with the [Canadian Table of Frequency Allocations](#) and spectrum utilization policies, this band is not shared with the FSS, making it attractive for high-density applications.

In March 2012, the Electronic Communications Committee (ECC) published a report analyzing the current and future fixed service uses in March 2012 (ECC Report 173).<sup>15</sup> The report's analysis was based on contributions from 28 European countries, including France, Germany, Russia and the United Kingdom, as well as feedback from 12 operating / manufacturer companies / associations. As noted in ECC Report 173, this band is used for backhaul applications by many European markets, the majority being medium- and high-capacity systems. With higher population densities in urban areas and the ensuing densification of commercial mobile systems, shorter range high-capacity two-way backhaul systems will be required to support these networks. Rogers expects that with the deployment of Long-Term Evolution (LTE) and LTE-Advanced systems, Canada will require more spectrum for short-haul high-capacity backhaul spectrum, particularly in urban areas.

In the context of the current allocation, the Department consulted on whether this band should be designated for point-to-point systems and made available for backhaul and other potential applications. Noting the growing demand and need for additional backhaul capacity, wireless service providers requested that the frequency band be made available immediately for two-way backhaul point-to-point applications.

The RABC, Rogers and AVIAT recommended that the band be made available solely for two-way backhaul point-to-point applications. Moreover, AVIAT stressed that the Department should allow the marketplace to decide the type of applications best suited for the band, envisaging that while mobile or enterprise urban backhaul will be the primary applications in the near term, future innovative applications will be abundant. With respect to licensing, site-based licensing was suggested to ensure the

---

<sup>15</sup> [ECC Report 173, Fixed Service in Europe: Current use and future trends post 2011](#). March 2012.

band's wider use and accessibility. Mobilicity foresees the band as an alternative to the highly utilized 23 GHz band, subject to equipment availability.

Given the existence of standards and availability of equipment developed for the ETSI markets, the RABC and Rogers requested that the band be available for the introduction of two-way fixed services. Furthermore, they noted that the Department should align its policy and technical rules with the European band and channelization plans (i.e. 812 MHz duplex spacing with 28 MHz, 56 MHz and 112 MHz bandwidth channels). While AVIAT supports duplex spacing of 812 MHz, it proposed channel sizes of 10, 20, 30, 40, 50 and 100 MHz given the probability of legacy systems. Large channel sizes were supported by respondents, as a means of meeting the growth in demand for large bandwidth applications, as well as LTE and LTE-Advanced deployments, with AVIAT recommending channel aggregation. Québecor Média Inc. urged the Department to permit backhaul deployments in the band, with sufficiently large channel bandwidths (i.e. at least 20 MHz).

In the light of current spectrum demand, the worldwide allocation for the FS, apart from in the United States, and use of the band in Europe, the Department agrees with the need to introduce fixed two-way point-to-point backhaul services in the band. From an equipment ecosystem viewpoint, it is recognized that modifications to established plans (i.e. duplex spacing, channel sizes) require customized equipment development. This could potentially limit equipment availability in Canada and ultimately timely access to the band. The Department will identify technical requirements, including specific coordination and sharing considerations with other services in the band, through the development of an applicable SRSP, in consultation with the RABC. This will also include practical measures to minimize the potential interference between stations in the FS and airborne stations in the radionavigation service, taking into account the operational needs of the airborne radar systems.

**Decision:**

**The Department will designate the frequency band 31.8-33.4 GHz for fixed two-way point-to-point radio systems.**

### **5.3 Retention of Existing Designations and Future Consultations**

Designations in frequency bands are updated from time to time in order to reflect changing priorities, significant technological changes or international developments. The following section provides an assessment of spectrum bands that were considered in the context of the consultation for the introduction of backhaul. While the Department ultimately decided to retain the current designation, there will be future opportunities to revisit the designations in these and any other frequency bands.

#### **5.3.1 6930-7125 MHz**

The frequency range 6930-7125 MHz overlaps two frequency bands (6700-7075 MHz and 7075-7145 MHz) as defined in the [Canadian Table of Frequency Allocations](#) (CTFA). The CTFA includes a primary allocation to the FS in the band 6700-7145 MHz, but is also allocated to the FSS (Earth-to-space) (space-to-Earth) on a co-primary basis within the 6700-7075 MHz frequency range. Additionally, other services share these bands through international footnotes.

Within the FS allocation, the band 6930-7125 MHz is designated for one-way television auxiliary services, including TV pick-up for the transmission of television programs to a television broadcast studio or to a cable television head-end, as well as for temporary TV links. TV pick-up operations are primarily located in metropolitan areas; however, they may also be rapidly deployed in other areas to cover breaking news events. Of the nearly 1,650 authorizations within the band (6930-7125 MHz), the vast majority are assigned to broadcasters for TV pick-up operations. While some of these systems are fixed, the bulk of them are transportable. Transportable systems are used by broadcasters to provide coverage of news events within a particular city, province or provinces. Although broadcasters are typically only authorized to use a single frequency at a time within their defined coverage area, they are licensed for multiple frequencies to facilitate coordination with other broadcasters and fast deployment within a given area.

As the band 6930-7125 MHz is adjacent to two frequency bands (6425-6930 MHz and 7125-7725 MHz) designated for fixed, point-to-point radio systems, the Department consulted on permitting similar systems (two-way backhaul applications) within this band, currently used by FSS and TV pick-up operations.

Wireless service providers, such as Vidéotron, Rogers, TELUS, Bell Mobility and the CEMC/EFC, welcomed the Department's proposal to introduce two-way backhaul systems into the band as a means to expand access and improve broadband services to rural Canadians and their businesses. Furthermore, Rogers, CEMC/EFC and Québecor Media Inc. indicated that the introduction of two-way systems would also aid in alleviating congestion issues in adjacent 6 GHz bands. TELUS went on to explain that it would also provide for additional flexibility for long-haul links (where low-frequency spectrum is required due to the utilization of passive microwave systems and active repeaters). All respondents recognized the need to protect existing FSS and transportable TV pick-up operations in the band.

Various suggestions were received regarding how this could be accomplished, emphasizing the benefits of expanding the band to leverage existing equipment and the recent introduction of fixed services within the TV Broadcast Auxiliary Service and Cable Antenna Relay Service (BAS/CARS) band 6875-7125 MHz<sup>16</sup> by the FCC in the United States. While there was support for harmonization with either the ETSI or the FCC, the main appeal was for sufficiently large channel widths of 20 MHz and greater.

Broadcasters stressed their requirement for flexibility in the coordination and rapid deployment of their TV pick-up and temporary TV operations systems given the unpredictable nature of news events. SaskTel voiced concerns that the introduction of fixed two-way backhaul systems in this band would negatively impact the use of this band for transportable TV pick-up operations, in both urban and rural areas. Furthermore, Shaw noted that as TV pick-up systems are not in use 100% of the time, interference may not arise until a broadcaster actually begins covering a live news event. As a result, Shaw does not support the introduction of two-way systems in geographic areas used by TV pick-up. Although, in principle, the broadcast membership within the RABC did not object to the sharing of spectrum by fixed two-way point-to-point and one-way TV pick-up systems, it emphasized that the mobility and rapid

---

<sup>16</sup> [FCC Report and Order 12-87](#) – *Second Report and Order, Second Further Notice of Proposed Rulemaking, Second Notice of Inquiry, Order on Reconsideration, and Memorandum Opinion and Order*. August 3, 2012.

response requirements of ENG preclude effective frequency coordination with non-ENG licensees operating in the same bands.

While broadcasters raised concerns regarding the introduction of two-way systems and the potential negative effect that it could have on their ability to cover breaking news events, respondents suggested potential sharing mechanisms. In particular, SaskTel, which did not support changes to allow other FS in areas with TV pick-up operations, noted in its comments that it would not object to the use of this spectrum for two-way fixed backhaul applications in rural and remote areas provided that these backhaul systems would not cause interference to existing systems. The following were suggested measures for the protection and sharing of the band between two-way point-to-point fixed systems and existing services, including FSS and transportable TV pick-up operations:

- restricting two-way operations to rural and remote areas;
- restricting operations to within a portion of the band, leaving the remaining portion of the band dedicated to temporary portable TV pick-up operations;
- establishing an exclusion zone guideline from TV pick-up locations in order to mitigate any possible interference issues;
- sharing of the band with FS operation in rural areas (where the band is not being used for ENG);
- implementing geographical separation based on an urban/rural split, with ENG operations allowed in urban areas and other applications confined to rural areas;
- evaluating existing rules that address similar technical and coordination issues in other bands (e.g. SRSP-302 provides guidance on sharing of the 2 GHz band (2025-2110 MHz and 2200-2285 MHz) between fixed systems and TV pick-up operations); and
- employing different deployment patterns for different services.

The RABC noted that feeder link Earth stations (space-to-Earth), for non-geostationary satellite systems of the MSS, operating in the band 6875-7055 MHz may be vulnerable to interference from terrestrial microwave stations. The operation of these systems should be considered if two-way systems are introduced into the frequency band 6930-7125 MHz.

Broadcasters have demonstrated their need for spectrum in order to cover and report on breaking news events and deliver television auxiliary services, including TV pick-up operations. As transportable TV pick-up operations can be deployed anytime and anywhere, coordination is of a particular concern. A plurality of broadcasters operating ENG systems at the same time and in the same location further exacerbates the coordination situation. The introduction of backhaul would limit the flexibility of broadcasters to quickly deploy and cover news events. Although these operations are primarily located in metropolitan areas, this is not always the case. Given the limited spectrum available for broadcast operations, multiple broadcasters and the associated congestion issues, the Department is of the view that introducing backhaul into the frequency band 6930-7125 MHz would be problematic.

**Decision:**

**The Department is maintaining the existing designation and usage of the frequency 6930-7125 MHz for one-way line-of-sight radio systems in the fixed service to provide television auxiliary services.**



### 5.3.2 7 GHz Band (7125-7725 MHz)

The 7 GHz frequency band is designated for high-, medium- and low-capacity systems, which include essential circuits that support the operation of power generating plants and high-voltage transmission lines. The [Canadian Table of Frequency Allocations](#) and spectrum utilization policies include a primary allocation to the FS and to other services, such as the FSS (space-to-Earth), meteorological-satellite (space-to-Earth), and space research (Earth-to-space) services. Additionally, the 7250-7375 MHz portion of the band is allocated to the MSS on a primary basis.

The current policy for the FS in the band 7125-7725 MHz<sup>17</sup> emphasizes the preferred, but not exclusive, access to two pairs of 30 MHz channels for telemetry, control and protection purposes in support of the power distribution grids by electric utilities. Furthermore, the technical rules state that 30 MHz channels will be allowed for use by the power utilities on a preferential basis.<sup>18</sup> Given the demand for additional spectrum for all types of backhaul applications, one of the discussion points within the consultation was whether to make all channels available for licensing regardless of the type of application (i.e. not solely related to utilities).

The Utilities Telecom Council of Canada (UTC Canada) noted in its comments that the band is heavily used by electric and power utilities and critical infrastructure industries.<sup>19</sup> It stressed that hydro microwave networks are expanding as a result of power system growth and demand, combined with provincial modernization initiatives, including legislative mandates to provide service to rural and urban communities, and grid reliability requirements. The RABC electric utility industry membership urged the Department to continue to provide it with preferential access to 30 MHz channels.

While it was anticipated that a transition from analog to digital systems by the electric utilities would make more spectrum available, in the process of upgrading their systems to digital, multiple 30 MHz channels have been requested to accommodate growth within the industry. CEA noted that given the inevitable growth in electricity demand and ever-increasing electricity supply, it is likely that electric utilities will make use of all 30 MHz channels, as well as the low-capacity channels in the 7 GHz band. This sentiment was echoed by BC Hydro, which requested preferential assignment of the eight 30 MHz frequency pairs in the 7 GHz band for power utilities in British Columbia.

The RABC recommended in its comments that the preferential access to 30 MHz channels by electrical utilities be retained, as well as the continued access by other users of the band. In the opinion of the majority of respondent wireless service providers, the band, including the 30 MHz channels, should be made available for all licensees for medium- and long-haul microwave links. That said, concerns were raised regarding congestion and the amount of spectrum available in lower frequency bands, with Shaw noting that a number of remote regions in Western Canada (mainly the mountainous regions along the British Columbia coastline and Vancouver Island) are highly congested in the lower frequency bands,

---

<sup>17</sup> [SP 7125-7725 MHz](#): *Policy for the Fixed Service in the Band 7125-7725 MHz*. December 1982.

<sup>18</sup> [SRSP-307.1](#): *Technical Requirements for Fixed Line-of-Sight Radio Systems Operating in the Band 7125-7725 MHz*. May 2006.

<sup>19</sup> Of the roughly 3400 licenses in the 7 GHz band, more than half were held by electric and power utilities and other critical infrastructure industry entities. Utilities Telecom Council of Canada (UTC Canada) comments.

particularly in the lower and upper portions of the 6 GHz band, as well as the 11 GHz band. It contends that opening up the 7 GHz band for this purpose would allow carriers the opportunity to enhance their network capacity to remote regions. This sentiment was echoed by Québecor Média Inc., which has experienced congestion in the Upper 6 GHz band (6425-6930 MHz).

The inability to access all 30 MHz channels within the band was deemed by some as inefficient use and a potential detriment to broadband deployments. TELUS recommended the Department remove the preferential access to 30 MHz channels if spectrally inefficient systems are being used. Although Rogers was in favour of preferential access by electric utility companies, it did request that the Department ensure that all users of this band take advantage of new technology to maximize the efficient use of this spectrum. While the requirement for spectral efficiency was supported and echoed by many, the view regarding preferential access was not uniformly shared.

In an effort to support the development of rural broadband, while cognizant of the critical infrastructure and reliability requirements of the utility industry, the Department will retain the current policy of reserving two 30 MHz channel pairs for the preferential use by electric and power utilities. However, in situations of spectrum congestion, access by all licensees (not solely electric and power utilities) to any available 30 MHz channel will be at the discretion of the regional or district directors.

**Decision:**

**The Department will retain the designation and preferential access to two 30 MHz channel pairs by electric and power utilities in the frequency band 7125-7725 MHz. In the case of spectrum congestion, all channels will be made available for licensing regardless of the type of application, or licensees.**

### 5.3.2.1 Diversity Techniques Within the 7 GHz Band

Diversity is used to provide equipment redundancy and improve propagation reliability. The primary diversity techniques employed by operators are frequency, space, polarization and route. While the Department generally dissuades frequency diversity, as it is not as spectrally efficient as other techniques given that it is the simultaneous transmission of the same traffic over two channels operating at different frequencies, the use of frequency diversity by systems serving telemetry, control and protection is allowed within the 7 GHz band, as per the current policy.

Given that one of the Department's objectives is to achieve and increase the efficient use of spectrum, and recognizing the inefficiency with frequency diversity, comments were sought on the continued use of frequency diversity by utilities in this band.

Utility companies noted in their responses that given their very high reliability requirement standards, compliance is difficult without the use of diversity techniques for redundancy purposes. CEA stated that electric utilities use frequency and quad diversity to meet their path availability criteria while also improving their equipment availability. In the case of hub and spoke spur links, without another medium to provide route diversity, frequency diversity provides the path diversity necessary to allow for in-service maintenance of radio equipment. Furthermore, UTC Canada indicated that, in many instances,

frequency diversity is the only feasible technique due to severe limitation imposed by technical and economic considerations (e.g. increased number of antennas and structural loading).

Many other respondents, including Québecor Média Inc. and Rogers, recommended that spectrally efficient diversity techniques be employed (e.g. space diversity) and that other less efficient techniques requiring additional spectrum and bandwidth only be allowed under exceptional circumstances. As frequency diversity can limit the amount of spectrum available to others and increase congestion, Shaw's preference was to no longer allow the use of frequency diversity techniques in the 7 GHz band.

There are many diversity techniques available other than frequency diversity, including space, polarization and route, which are more spectrally efficient. The Department encourages the use of spectrally efficient diversity techniques, where necessary, for redundancy and reliability purposes. The Department, acknowledging the regulatory reliability requirements of the electrical utilities and that each diversity technique may not be technically feasible in every instance, will continue to permit the use of frequency diversity.

**Decision:**

**Within the 7 GHz band, use of frequency diversity by systems serving telemetry, control and protection purposes is allowed, where reasonable technical justification is provided.**

### 5.3.3 8275-8500 MHz

In Canada, the band 8275-8500 MHz is allocated to the FS on a co-primary basis, along with EESS (space-to-Earth), FSS (Earth-to-space) and Space Research (space-to-Earth), in accordance with the *Canadian Table of Frequency Allocations* and spectrum utilization policies. The FS is designated for line-of-sight radio systems conveying video signals that require a radio frequency bandwidth of up to 18.75 MHz and, on a case-by-case basis, for carrying wideband radar video information on systems having a bandwidth of up to 37.5 MHz.

Given the current FS allocation and designations, the Department consulted on whether this band should be opened up for point-to-point systems and be available for backhaul in light of the congestion experienced in some of the lower frequency bands.

Currently, the Department of National Defence (DND), the Canadian Space Agency and broadcasters all have deployments within the band. DND has licences for portable FSS Earth stations in the uplink direction (7900-8400 MHz). While temporary in nature, there is a requirement for quick deployment of these FSS terminals, which are usually operational for only a relatively short period of time (e.g. one week). Although the FSS terminals are usually located away from populated areas, DND foresees increased usage of them across Canada. It was noted that given the portable nature of these devices, any additional coordination may present potential delays in deployment.

The Canadian Space Agency has deployed RadarSat satellite networks which transmit wide-band information to transportable Earth stations within the 8025-8400 MHz portion of the band. A third-generation satellite network, the RadarSat Constellation Mission (RCM), is deployed to assert

Canada's sovereignty, monitor and manage the resources, and keep watch over Canada's vast territory and coastal areas. The RCM mission encompasses Earth stations at various locations across Canada.

Broadcasters also make use of the band for one-way video distribution and note high demand in urban areas. Demand is further fuelled by the highly competitive news market covering live and breaking news events, which results in multiple licensees operating ENG systems at the same time and in the same location. While the number of users and the transient nature of these operations make the coordination process more difficult, CBC/Radio-Canada supports this suggestion, as it is an alternative for the lack of availability in the 6 GHz band for point-to-point communication.

There is much additional support from wireless service providers, including TELUS, Rogers, Québecor Média and AVIAT, for the introduction of fixed two-way backhaul systems within the band 8275-8500 MHz. TELUS noted that it would help to alleviate congestion currently experienced in the Upper 6 GHz and 8 GHz bands. However, concerns were raised regarding sharing and coordination of backhaul with DND's transportable FSS terminals.

Given the transportable nature of DND and broadcast operations currently deployed (i.e. ENG and earth stations), coordination, protection and growth of existing networks would be difficult. As the majority of DND and CSA systems are located outside of urban and metropolitan centres, one consideration would be the sharing on a geographical basis (i.e. urban/rural split), whereby fixed backhaul systems could deploy within urban areas. However, this is further complicated by broadcasters' coverage of local events, which are primarily within urban areas. The Department is also cognizant of the Earth exploration-satellite service allocation within the band and its protection. Another option considered was the introduction of backhaul within the band 8400-8500 MHz; however, this was deemed ineffective due to the relatively small amount of spectrum available within the band and requests for large bandwidths (e.g. 20 MHz and larger).

Although there is a general need for spectrum designated for backhaul below 13 GHz and support for the introduction of two-way systems by wireless service providers, the protection and continued growth of existing DND and Canadian Space Agency systems is imperative. With the complex usage within the band and the other frequency bands available for backhaul in this general spectrum range (e.g. 7125-7725 MHz, 7725-8275 MHz and 10.5-10.68 GHz frequency bands), the Department will retain the existing designation for the band 8275-8500 MHz.

**Decision:**

**The Department is maintaining the existing designation and usage of the frequency band 8275-8500 MHz.**

#### 5.3.4 40.5-43.5 GHz

The above-noted frequency range is allocated in on a co-primary basis to the FS and the FSS (Earth-to-space), the broadcasting and broadcasting-satellite services (40.5-42.5 GHz), and the mobile (except aeronautical mobile) and radio astronomy services (42.5-43.5 GHz). Other services share the band on a secondary basis in accordance with the CTFA and spectrum utilization policies.

In 2010, in an effort to relieve congestion within the 38 GHz band, point-to-point links for backhaul were introduced into the 42 GHz band, once exclusively designated for Multimedia Wireless Systems (MWS) in Europe.<sup>20</sup> Within the 42.5-43.5 GHz portion of the band, High Density Fixed Service (HDFS) has priority over uncoordinated FSS terminals. This spectrum (six blocks) was auctioned in the United Kingdom in 2008.

Given the use of the band in Europe for backhaul applications, the Department consulted on whether this band should also be available for such use in Canada.

There is strong interest in this band by wireless service providers for the immediate deployment of fixed systems, specifically for short-haul high-capacity backhaul systems to support LTE and LTE-Advanced mobile broadband networks. Rogers noted that the band would be apt for medium- and high-density area deployments. Given that the band has been recommended for wireless broadband systems by the European Union, ETSI and CEPT, the RABC noted the feasibility of introducing backhaul given the existence of an ETSI equipment ecosystem. As such, it recommended making the band available for backhaul applications as soon as possible.

To maximize the potential of the band, TELUS, Rogers and Québecor Média insist on wide channel sizes (e.g. greater than 20 MHz) to support and maximize increased capacities. Additionally, Rogers agrees with TELUS' recommendation of spectrum licensing in a manner consistent with that of the 38 GHz band (i.e. an FCFS basis within a constrained geographic region), facilitating rapid deployment.

Conversely, EchoStar supports a soft segmentation approach to facilitate deployment of high density applications in the FSS (HDFS) within the 40.5-42.0 GHz portion of the band, ensuring sufficient spectrum for HDFS. It further argued that if FS backhaul systems are deployed in the portion of the band that has been segmented in favour of HDFS systems, it will not be possible to issue blanket licenses for small satellite terminals in this band. This would undermine the development of HDFS systems. The harmonization of the band with the United States and other CITEL countries was highlighted as another consideration for maintaining the current designation.

Additionally in reply comments, four satellite operators (Telesat, Ciel Satellite Limited Partnership, SES Americom, Inc. and Hughes Satellite Systems Corporation) emphasized that HDFS systems aid in bringing broadband services to rural areas and that the technology that underlies HDFS systems is very close to being ready for commercial use and, once launched, will be capable of providing data rates that are comparable to those that are available in urban areas.

The Department recognizes that deployment of advanced wireless access technologies, such as HSPA and LTE, which support mobile broadband services, has required both network densification and additional backhaul capacity. In June 2012, the Department designated 12.9 GHz of spectrum in the bands 71-76 GHz, 81-86 GHz, 92-94.0 GHz and 94.1-95 GHz for use by short-haul point-to-point backhaul systems in support of broadband applications. This particular spectrum supports large bandwidths and urban densification generated by mobile broadband demand. Given the amount of spectrum recently introduced for short-haul backhaul systems, the Department believes that there is currently sufficient spectrum in the upper frequency bands to address backhaul needs. This also balances

---

<sup>20</sup> [ECC Report 173](#). *Fixed Service in Europe: Current use and future trends post 2011*. March 2012.

the FSS community's continued interest in HDFSS deployments within the 40.5 GHz band. The Department will continue to monitor uptake of HDFSS deployments to ensure its reasonable utilization.

**Decision:**

**The Department will continue to review and monitor the uptake of HDFSS deployments within the band 40.5-43.5 GHz. This will be taken into consideration in future policy and licensing frameworks and may be the subject of a future consultation regarding designation of the band.**

#### 5.4 Additional Backhaul Spectrum Considerations

Industry also provided the Department with additional suggestions for frequency bands to be considered for backhaul purposes: 3550-3650 MHz, 4.9 GHz, expanding the 23 GHz band to include 21.2-21.8 GHz paired with 22.4-23 GHz, 29.1-29.25 GHz paired with 31.0-31.3 GHz, and 57-66 GHz.

As these frequency bands were not the subject of the Department's proposals in the consultation and not all stakeholders may have had an opportunity to comment, understand or discuss these new proposals, the Department does not plan to address the aforementioned bands within this decision. Nevertheless, these comments provide the Department with valuable information to further its technical and strategic planning functions.

The Department notes the industry's interest in these bands and may initiate consultations in the future, as warranted. However, given the recently released 3475-3650 MHz consultation<sup>21</sup>, the Department is not prepared to entertain preferred access for utilities. Additionally, with the global designation of the frequency band 57-66 MHz for licence-exempt usage and the benefits in aligning the spectrum use and designations within the worldwide marketplace, the Department does not plan to consult further on possible changes to this band in the near future.

#### 6.0 Geographical Differences Policy Guideline

Industry Canada's Geographical Differences Policy (GDP) guideline permits the relaxation of policy and/or technical requirements in uncongested areas and enhances provisions in congested areas, recognizing the need for flexibility in spectrum utilization policies and technical standards. This two-pronged guideline allows licensees to economically redeploy older equipment in uncongested areas while requiring that enhanced policies and standards, such as improved antenna off-axis discrimination performance, be met to ensure that the maximum number of systems can be accommodated in congested areas.

---

<sup>21</sup> For details, see DGSO-003-14, *Consultation on Policy Changes in the 3500 MHz Band (3475-3650 MHz) and a New Licensing Process in Rural Areas*, at <http://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf10841.html>. August 2014.

## 6.1 Retention of the GDP Guideline

SaskTel highlighted the benefits of the GDP guideline, which includes the economical deployment of broadband in rural areas, citing lowered associated costs, extended equipment life and smaller antennas in areas of low population densities. The concept and application of the GDP guideline were generally supported by the majority of respondents, apart from TELUS. TELUS stressed that the relaxation of spectral efficiency, even in rural areas, can lead to increased congestion, which it feels is counter to the Department's objective of encouraging the efficient use of spectrum. However, the majority of respondents commended the Department's efforts in recognizing different demographic, economic and communication activities in various areas of the country.

As indicated, the application of the GDP is based on congestion areas. The four types of congestion areas (uncongested, normal congestion, moderately congested and highly congested) are defined within *SP 1-20 GHz: Revisions to Microwave Spectrum Utilization Policies in the Range of 1-20 GHz*,<sup>22</sup> and are based on ranges of channel availability.

Respondents had varied comments with respect to the practicability of these definitions. In an effort to simplify the GDP definitions, the RABC suggested reducing the number of areas from four to three (i.e. uncongested, moderately congested and congested). Although providing revised definitions,<sup>23</sup> the RABC also commented that this should be the focus of a departmental review with the benefit of outside expertise. Rogers concurred, noting that the current definitions have their limitations in that they only provide a high level picture of the degree of congestion. Others, such as MTS Allstream, ABC Communications, TELUS and Shaw, contend that the current definitions are still practical. SaskTel noted that although reasonable, the definitions are highly complex.

While the concept of congestion is relatively simple, there are many factors and aspects that make it complex to assess. There are numerous considerations that must be factored into these discussions, such as frequency band, frequency reuse, antenna characteristics, the geographic area, terrain and topology. Rogers, illustrating the role that frequency plays in congestion, explained that lower frequency bands tend to become congested more easily, as signals propagate over longer distances than in higher frequency bands which have more limited propagation characteristics. As congestion area definitions are based on channel availability, frequency reuse and antenna characteristics have a large role in determining where and if a particular channel is available. The geographic area in question also has a bearing on congestion, in that the terrain and building attenuations may also affect signal propagation. Furthermore, as lower frequency bands are more heavily used outside of population centres, congestion does not necessarily follow urban and rural population boundaries.

As wireless microwave may be the only practical option for backhaul in rural areas, flexibility and cost-effectiveness are important in ensuring deployment. The Department acknowledges the wide-ranging support for the GDP guideline and the importance of distinguishing between congestion areas in terms of network design. It further acknowledges the complexity of issues related to defining

---

<sup>22</sup> [SP 1-20 GHz: Revisions to Microwave Spectrum Utilization Policies in the Range of 1-20 GHz](#), January 1995.

<sup>23</sup> Uncongested area: 70% or more of channels available in 80% of possible directions, moderately congested area: 30-70% of channels available in 80% of possible directions and congested area: 30% or less of channels available in 80% of possible directions.

congestion. As this is a complex topic, the Department will engage with the RABC on how best to define and portray congestion areas.

**Decision:**

**The Department will retain the GDP guideline and continue to permit some relaxation of policy and/or technical requirements in uncongested areas and enhanced provisions in congested areas.**

## 6.2 Technical Requirements Subject to the GDP Guideline

Through the application of the GDP and, depending on the congestion area, technical standards may either be relaxed or enhanced. While the antenna pattern is the most common specification to be relaxed in uncongested areas and enhanced in moderately and highly congested areas, the following is a list provided by respondents on other policy and requirements that could be eased or enhanced:

- antenna size;
- spectral efficiency;
- channel size; and
- modulation.

ABC Communications specifically highlighted the benefits of the GDP in providing services to remote areas and suggested the relaxation of spectral efficiency requirements in uncongested areas. It recommended permitting spectral efficiency limits as low as 0.5 bit/sec/Hz to permit the establishment of inexpensive new systems in order to provide basic services in extremely remote areas. TELUS, in its comments, was not supportive of relaxing efficiency requirements in uncongested areas, as it could lead to increases in coordination issues and congestion, counter to the Department's objective of encouraging efficient spectrum usage.

As the guidelines are written, there is no list outlining the technical standards that may or may not be relaxed. SaskTel suggested that the establishment of a rigid set of criteria may be too restrictive and may not include all scenarios. It recommended that the Department evaluate each request on a case-by-case basis, allowing the Department to remain flexible in its approach. TeraGo supported this view provided that the interests of all users in the band were considered and protected.

The Department acknowledges that some licensees may be uncertain whether particular characteristics may or may not be relaxed. This uncertainty can lead to deployment delays. However, the Department is cognizant of the need to remain flexible and adaptable in interpreting the applicability of the GDP. As such, the Department will develop an FAQ detailing certain technical requirements that could be enhanced or relaxed, depending on the congestion area. This will allow for more rapid turnaround and improved client certainty by providing licensees with the necessary confidence in ensuring that their network design and plans meet the permitted criteria.



However, applicants are encouraged to contact the Department's regional or district offices at the earliest possible opportunity to discuss the planning of their proposed systems, which includes whether the GDP would be applied in specific instances.

### **6.3 Frequencies Subject to the GDP Guideline**

The GDP guideline is detailed in *SP 1-20: [Revisions to Microwave Spectrum Utilization Policies in the Range of 1-20 GHz](#)*. As such, it may give the illusion that it only applies to frequencies within this range. However, it is essentially applied to the majority of fixed line-of-sight point-to-point bands within the frequency range 2-28 GHz through each band's respective SRSP.

There were polarized views on whether the GDP should be applied universally or only to specific bands. Rogers suggested that the guideline be extended to new and soon-to-be-released bands, whereas Shaw recommended that the application of the guideline be expanded to all FDD bands, not solely to microwave backhaul bands. Others, such as ABC Communications, supported the application of the guideline in the 1-20 GHz frequency range, but had issues with its application in frequency bands above 20 GHz, stating that the relaxation of antenna pattern or spectral efficiency guidelines in uncongested areas would serve no practical purpose in higher frequency bands. MTS Allstream completely disagreed and argued that the GDP should capture frequency bands facing congestion issues and increased demand (e.g. 23 MHz, 38 MHz, and 60-80 MHz bands), in an effort to accommodate the maximum number of deployments.

The Department recognizes that there may be some misinterpretation regarding when the GDP can be applied (i.e. frequency band). Although the Department will allow the application of the GDP across all traditional microwave bands for backhaul applications, it understands that it may not be as relevant in the upper frequency bands given the overall amount of spectrum available and their high frequency reuse capabilities. The Department's regional and district offices will continue to retain the flexibility in interpreting and applying the GDP.

## **7.0 Spectral Efficiency**

Spectrum is a finite resource and with the continuing evolution and creation of new wireless services, expanding networks, growth in traffic, innovative applications and technology, it has become even more congested in parts of the country. This has resulted in an increasing need for efficient spectrum usage. As a result, the Department promotes and encourages licensees to use spectrum efficiently, and has incorporated minimum requirements and provisions within its radio technical standards, as well as through its daily licensing operations in an effort to optimize the utilization of spectrum.

Through the consultation, the Department sought comments and proposals on mechanisms to encourage greater spectral efficiencies. The RABC and other respondents noted that maximizing spectral efficiency is not solely a technical issue, but that consideration for the economic and functional aspects was also essential. Given the broad topic of encouraging spectrum efficiency, the considerations and recommendations by commenters were grouped into three categories: economic; technical; and functional, and are discussed in the following sections.

## 7.1 Economic Considerations

To promote the efficient allocations of resources, and to ensure a fair economic return to the general public, the Department charges licensing fees for the use of spectrum. Current fixed point-to-point licence fees are founded on a capacity-based model, which translates the throughput delivered over a link to its equivalent number of voice channels.<sup>24</sup>

TeraGo, along with many other respondents, urged Industry Canada to initiate a consultation on fees as soon as possible. Moreover, the predominant recommendation was specifically moving to a consumption-based model whereby fees would be calculated based on the amount of spectrum used (bandwidth), providing an economic incentive to achieve efficiencies. Respondents, including SaskTel, emphasized that a consumption-based fee model would result in high spectral efficiencies by providing incentives for operators to reduce the spectrum consumed, as there would be a direct correlation between the amount of spectrum used and radio licence fees. Québecor Média Inc. noted that economic incentives would also have an added benefit in potentially alleviating congestion in specific frequency bands, as licensees would strive to maximize the efficient use of spectrum.

With the advance of technology, modern radio equipment can transmit more capacity over the same or even less spectrum than previously required. As such, fees are viewed as penalizing licensees making use of modern highly spectrally efficient equipment and promoting inefficient spectrum use. The introduction of reasonable fees was viewed as a sufficient incentive for the adoption of spectrally efficient equipment. This general view was emphasized in ABC Communications' comments that the single greatest deterrent to implementing higher spectral efficiency in backhaul links is the outdated billing mechanism, which prices spectrum based on throughput rather than on spectrum usage. In the same vein, TELUS recommended a fixed rate of \$30/MHz for all backhaul links regardless of capacity.

Backhaul capacity has increased significantly over the past few years, driven by the growth in mobile and fixed broadband traffic. Where, in the past, backhaul T1 links (i.e. throughput rates of 1.5 Mbps) were sufficient, the use of OC-3 capacity (roughly 130 Mbps) is now becoming standard practice. Rogers emphasized that under the current fee model, as capacity upgrades drive licensing fees higher and higher, microwave backhaul systems may no longer be economically viable. Some also voiced concerns that fees have become a deterrent, even precluding the use of certain frequency bands, namely 71-76 GHz and 81-86 GHz.

Other commenters suggested additional licence fee considerations. Mobilicity suggested that licence fees take into consideration the type of backhaul network and the use of spectrally efficient equipment. AVIAT suggested that the Department consider throughput and path length as part of its licence fees, while the RABC recommended that technical efficiencies also be considered, specifically higher modulation and more spectrally efficient transmissions. ABC Communications indicated that spectrum congestion should also be a factor, namely that fees would be higher in areas of high congestion and be lower in uncongested areas, lending itself to further encouraging rural deployments. This approach also

---

<sup>24</sup> For the purpose of calculating the radio licence fees payable for a radio licence authorizing operation on certain frequencies for radio apparatus installed in a fixed station or space station referred to in section 61 or 65 or 73 of the *Radiocommunication Regulations*, paragraph 58(c) applies: *one digitally modulated channel is equivalent to the number of telephone channels calculated by dividing the modulation bit rate by 64 kilobits per second.*

encourages licensees that are deploying in highly congested areas to make the most of their spectrum usage, as the fees would be at a premium given the location.

Not only was a new fee structure recommended to encourage spectral efficiency, the RABC, Rogers and Bell Mobility all stressed that reasonable fees were also needed. The RABC cited Canada as having one of the highest licensing fee regimes among the OECD countries and pointed out that it is even exceedingly high compared to the United States. This was further emphasized by Rogers, which noted that the fees were as much as 70 times higher in Canada than in the United States, over a 10-year period. It was further highlighted that as the nature and capacity of traffic evolve, so too should the associated fees, reflecting the current radio spectrum environment.

Not all administrations charge licence fees in the same manner, as noted in ECC Report 173. For example, in the United Kingdom, fees are based on both demand for the spectrum and a function of the amount of spectrum consumed (bandwidth). In France, only civil telecommunications operators pay licence fees. The fee model is dependent on bandwidth, frequency band and spectrum efficiency – the larger the bandwidth, the higher the fees; and the higher the frequency band, the lower the fees.

The Department recognizes stakeholders' concerns and the difficulties highlighted with respect to the current capacity-based fee structure as it relates to point-to-point and backhaul systems. Industry Canada appreciates that since radio licence fees were first introduced, technologies and system requirements have changed dramatically. The Department is conducting a comprehensive review of licence fees and will consult on any proposed revisions to how they are established and assessed.

## **7.2 Technical Considerations**

While the capacity of a system may be dictated by several technical and economic factors, high carriage capacity cannot be achieved without high spectrum efficiency. Spectrum efficiency can be described on a microscopic level by the amount of throughput within a given channel bandwidth, and on a macroscopic level by the number of frequencies assigned (density) within a given area and frequency reuse. A high macroscopic spectrum efficiency is a crucial objective for good spectrum utilization policy. To this end, the Department works to optimize frequency reuse through its licensing practices and establishes minimum spectral efficiency levels and antenna requirements within its technical standards.

Currently, spectral efficiency requirements in technical standards (SRSPs) are well below equipment capabilities. As such, higher spectrum efficiency can be attained by increasing the minimum spectral efficiency requirement within the SRSPs. TELUS recommended that for new and existing systems, the minimum spectral efficiency be increased from 1.0 bps/Hz to 4.4 bps/Hz, with a five-year transition period for existing links and grandfathering on a case-by-case basis. Rogers suggested that there be a distinction in efficiency standards between congestion and non-congested bands. Others suggested that minimum efficiencies be linked to capacity designations, channel bandwidths and frequency bands. The RABC noted in its response that even though backhaul links are designed to achieve certain capacities, in practice, these levels can be 4 to 6 times less than their maximum capabilities specifically due to the nature of the bursts and asymmetric nature of Internet-based traffic.

AVIAT contends that while minimum efficiency limits are useful, too stringent of a spectral efficiency may limit the development and use of future innovative applications. It stressed that attention should be

paid so as not to unnecessarily limit or prevent the use of low latency types of applications, which are not as focused on high data rates. A similar concern was raised by SaskTel in that the Department should not mandate particular spectral efficiencies, but encourage licensees to use only the minimum channel bandwidth necessary for their deployments.

As part of the Department's routine review of SRSPs, it will continue to assess the minimum spectral efficiency to ensure that it accurately reflects advances in radio equipment technology, current usage and capacity designation of the frequency band. Any necessary revisions will be conducted in consultation with the RABC and in accordance with international standards. Noting this, the relaxation of technical requirements, including spectral efficiency, may be desirable as a means to encourage mobile broadband deployment in areas where congestion is not a concern. Recognizing the need for flexibility in the application of policy and standards, the Department will continue to apply the GDP guideline in relation to spectral efficiencies in specific instances where warranted (e.g. uncongested and congested areas).

### **7.2.1 Equipment Technical Standards**

Backhaul technology is evolving. The Department encourages the use of advanced equipment and radio techniques to ease the growing capacity issues within backhaul. New innovations and trends, such as the use of adaptive coding, adaptive modulation and higher modulation schemes, are well suited for high-capacity links, as well as advances in the area of co-channel dual polarization (CCDP), automatic transmit power control (ATPC), and multiple-input, multiple-output (MIMO) technology. Although these and others mechanisms all increase capacity, the Department still requires that their operations not compromise existing deployments or services within the band, nor their orderly development.

Although most respondents acknowledged the need and benefit of using the latest spectrally efficient equipment, many respondents, including Shaw, Québecor Média Inc. and TELUS, recommended that such use not be mandated by the Department through policy or standards, but be encouraged where feasible. They stressed that while these techniques are generally efficient, they may not be suitable in all types of situations or frequency bands, as operators balance cost, capacity and reliability trade-offs.

Specifically, the Department sought comments on the use of the following techniques:

- radio systems that employ adaptive modulation, noting that during adverse propagation conditions, the systems' spectral efficiencies may fall below the specified minimums;
- radio links that use CCDP to effectively increase the capacity over the same channel; and
- systems that make use of channel bonding to effectively increase the available bandwidth.

#### **7.2.1.1 Adaptive Modulation**

Adaptive modulation is a feature that allows the radio to vary the modulation, adapting to changing radio link conditions, ensuring optimal throughput. The highest order modulation is selected when propagation conditions are favourable; however, as these conditions begin to deteriorate (when there is fading), the modulation is lowered to maintain the communication link. During adverse conditions, rather than suffering a complete outage, lower order modulation allows for the continued transmission of critical traffic, at a reduced bit rate. This technique essentially enhances the overall efficiency of the link by enabling additional throughput during favourable conditions and improving availability during severe conditions.

Respondents to this question supported the use of adaptive modulation given that it improves link reliability, allows for selective reliabilities for different data types (e.g. voice, data, etc.) and does not increase the interference environment provided that the licensed power and highest modulation used are coordinated. ABC Communications further noted that only in adverse conditions and for brief periods would the efficiency of the link fall below the specified minimums. Siklu echoed this sentiment, noting that a typical link will operate at low modulation for only a few minutes or few hours over the year and that the rest of the time, the link will operate at its highest modulation.

TELUS maintains that the current fee structure penalizes the use of advanced techniques, such as adaptive modulation, as there are higher fees associated with the use of higher modulation schemes (as capacity is increased). TELUS contends that operators facing growing demand are encouraged through the current fee regime to use additional frequencies (i.e. more spectrum) to increase their capacity rather than adopting other spectrally efficient techniques.

The Department's technical standards include a minimum spectral efficiency that ensures and promotes the efficient use of spectrum by radio links. In an effort to balance the flexibility needed by operators during adverse conditions while maintaining spectral efficiency, the Department will allow the use of adaptive modulation provided that the link is designed to meet the stated minimum efficiency. Situations where operations fall below the defined efficiency level will be permitted for a short period of time.

**Decision:**

**The Department permits the use of adaptive modulation provided that the link is designed to meet the stated minimum spectral efficiency, as prescribed in the associated technical standard (SRSP).**

### 7.2.1.2 Co-Channel Dual Polarization

Co-channel dual polarization (CCDP) with cross-polarization interference cancellation (XPIC) allows for the transmission of two separate signals on the same frequency, using both vertical and horizontal polarization over the same path. This increases the capacity without having to increase the amount of spectrum used.

Industry Canada has already begun licensing links employing this technique on a case-by-case basis. While there was support and encouragement for the continuation of this practice, a few respondents noted that even though CCDP increases capacity, it does not necessarily improve spectral efficiency because it can potentially make future coordination more difficult (i.e. the "other" polarity may not be available to other systems).

Siklu noted that the use of CCDP may not be necessarily applicable in all frequency bands, especially in upper frequency bands (e.g. E-band) given the large amount of available spectrum and high frequency reuse capabilities. TELUS further argued that these techniques should be driven by market forces and encouraged through the restructuring of microwave fee policy. It was noted that there is no incentive for licensees to implement CCDP, as the current fee structure penalizes this form of spectral efficiency.

The Department acknowledges that although the channel reuse in the same vicinity may be somewhat reduced as the alternate polarization is no longer available, the amount of spectrum consumed is also reduced through the use of CCDP. It is the Department's opinion that the capacity and spectrum benefits (i.e. single frequency pair rather than two frequency pairs) of implementing CCDP outweigh the potentially more complex coordination scenarios that dual polarized antennas could create. The continued use of CCDP will provide operators with the flexibility to increase their backhaul capacity while minimizing the need for additional spectrum. Although the Department encourages the use of CCDP, it is important to note that there are alternate methods that operators can use to address capacity issues. Applicants are encouraged to contact the Department's regional and district offices to discuss specific scenarios, given their needs and the local spectrum environment.

**Decision:**

**The Department permits the use of co-channel dual polarization.**

### 7.2.1.3 Channel Bonding and Larger Channel Bandwidths

Channel bonding is the simultaneous use of two separate non-overlapping channels for the transmission of more data over a single link, essentially creating a larger channel. Channel bonding can be the aggregation of adjacent channels or non-adjacent channels.

Most respondents recommended that the Department permit channel bonding where feasible, subject to coordination. Though there was support for channel bonding, TELUS argued that channel bonding does not lead to improved spectral efficiency.

While there was specific support for channel bonding, other comments were more general in nature, citing a basic need for larger channel sizes. The designation of channelling plans with larger channel bandwidths was viewed as accomplishing a similar outcome. IT and Telecom Committee of Consumer Electronics Marketers of Canada (CEMC) / Electro-Federation Canada, Rogers, SaskTel, Québecor Média, Bell Mobility and the RABC recommended that the Department allow larger channel bandwidths. With most manufacturers offering bandwidths of 56 MHz in most bands (up to 80 MHz in others) and European markets allowing 112 MHz channels, concerns were voiced that the Department's channel plans do not align with capabilities of new backhaul technologies. Accordingly, concerns were further voiced that microwave backhaul is not operating at its full capacity.

While the RABC pointed out the benefits of larger channels namely lower equipment and electronic costs and simplified installations, AVIAT cautioned that varying bandwidth sizes, including smaller channels, are still necessary to support new and innovative applications, some of which may be latency rather than capacity dependent. The IT and Telecom Committee of CEMC / Electro-Federation Canada suggested that the Department maintain its current bandwidths of 10 MHz to 40 MHz sizes, but allow for the aggregation of two channels (e.g. up to 80 MHz).

The FCC has recently updated its channel plans in the Lower 6 GHz (5925-6425 MHz) and 11 GHz (10.7-11.7 GHz) frequency bands to accommodate larger channel sizes of 60 MHz and 80 MHz respectively. The European band plans also allow for larger bandwidths, including 28 MHz, 29.65 MHz

and 40 MHz in frequency bands below 10 GHz and 56 MHz and 112 MHz in the 10-50 GHz frequency range.

To ensure the optimization of spectral efficiency, the Department regulates and specifies centre frequencies of available channels. Without defined channels and frequencies, the aggregation of various channel sizes can result in overlapping bandwidths. By not properly aligning centre frequencies with existing narrower channels, the ability to coordinate multiple links decreases, resulting in reduced reuse and the potential for spectral inefficiencies. Recognizing that increased channel widths support high-capacity applications while minimizing the number of necessary radios, the Department will explore the feasibility of designating wider channels in particular frequency bands. This will be done in conjunction with the routine updating of the Department's technical standards (i.e. SRPS). The continued specification of centre frequencies will also provide certainty to manufacturers as they develop equipment.

**Decision:**

**The Department will not permit the aggregation of channels. It will review and identify particular frequency bands that will benefit from larger channel sizes.**

The Department encourages the use of spectrally efficient techniques to ease both congestion and capacity concerns facing the wireless industry, especially within the frequency bands traditionally used for backhaul. While TELUS argued that these techniques should be driven by market forces and encouraged through the restructuring of microwave fee policy, the Department contends that market demand and equipment availability are the key drivers of advanced techniques, and that any perceived regulatory barriers limiting their use should be removed.

#### **7.2.1.4 Additional Advanced Features and Techniques**

Manufacturers continue to develop and introduce a variety of technologies and mechanisms to address growing backhaul traffic requirements. As outlined in the preceding sections, equipment is currently available to address some of these needs. Siklu forecasts that with a reliance on small-cell wireless applications, throughput requirement in the range of 20-500 Mbps should be expected. As such, Siklu and other manufacturers and operators contend that given that additional advanced techniques and radio equipment features will be necessary, there will be an emerging and growing need for high-capacity backhaul systems, new niche applications and uses.

Respondents also provided information on additional advanced techniques that can be used to accommodate greater capacities and spectral efficiencies, including higher modulation orders for increased throughput; ATPC in which the transmit power is automatically increased during adverse conditions (weather, propagation, etc.); multiple-input, multiple-output (MIMO) to increase capacity and/or link availability; diversity (space, frequency and QUAD) and channel protection to solve propagation issues; time division duplexing (TDD) to meet asymmetric backhaul needs while minimizing spectrum usage; and packet/hybrid microwave to enable the transmission of high-priority data and voice. Further to these techniques, CommScope suggested the introduction of additional more stringent antenna standards, to allow for increased deployments and reduced congestion levels.

The RABC highlighted the spectral efficiency benefits of using higher modulation orders (i.e. to reach 60 Mbps, an operator can use 10 MHz with 256-QAM or 20 MHz with 16-QAM). Moreover, there are readily available radios with modulation formats of 512- and 1024-QAM and even systems boasting 2048- and 4096-QAM are becoming accessible. However, the resulting capacity increases are not infinite and, as AVIAT noted, there is a diminishing rate of return with the very high modulation rates as you move up the modulation index.

The Department was also encouraged to harmonize wherever possible with the United States for the creation of North American common products. While there are many benefits, economies of scale and ease of international coordination were stressed as the primary motivations. Harmonization with Europe (ETSI) and ITU standards were also encouraged; however, this was viewed as secondary to a unified North American standard approach.

In general, most respondents urged the Department to encourage and allow the use of new techniques and technologies where feasible. Some respondents, including the RABC, promoted the modernization of policies and standards. This modernization would allow for: advances and the natural evolution of equipment; a variety of innovative applications which focus on heavy data usage; and applications with data bursts. Others, including ABC Communications and TELUS, preferred that the Department take a hands-off approach (i.e. few technical restrictions), allowing operators the flexibility to make the best use of changing technology. TELUS further noted that this approach would facilitate improving the uptake of spectrally efficient equipment.

Industry Canada strives to provide a balanced approach in ensuring the flexibility to access new or improved technology and services. The Department also develops technical standards that help to maximize spectral efficiency. In light of the technological evolution of communications equipment, the Department implements necessary updates to policies in an effort to respond to the changing marketplace. The Department's standards will remain technology-neutral, allowing the necessary flexibility in the use of modern and innovative technology to provide backhaul services. By enabling the use of more flexible and cost-effective backhaul solutions, the Department is supporting the deployment of broadband infrastructure across Canada.

Beyond advances in equipment and setting spectral efficiency limits within technical standards, both link density and frequency reuse within a particular area are also forms of spectrum efficiency. Maximizing these aspects ensures a large number of deployments, and permits additional licensees to make use of the remaining spectrum.

The Department notes there is no single technical parameter, appropriate in all situations, which will ensure greater efficiency. A combination of technical spectrum management considerations is necessary to maintain and support a high degree of spectrum efficiency. As such, a series of flexible best practices adaptable to changing requirements, radio environments, types of applications and technological advances will continue to be employed in managing the spectrum throughout the licensing process. In particular, licensees will be required to justify the channel bandwidth requested in their licence applications, reutilize frequencies as practical and return all unused FCFS spectrum to the Department.



### **7.3 Designation Considerations**

A variety of industries rely on fixed backhaul systems for a host of applications. Bidirectional point-to-point links are deployed by wireless service providers on national, regional or local levels for carriage of Internet, data and voice traffic over long distances, by hospitals and universities for the interconnection of campuses, by electric utilities, by all levels of government, and for backup purposes to improve reliability. The broadcast industry mainly uses unidirectional data links for television and audio broadcasting studios to the transmitters, as well as cable television distribution.

These diverse groups of licensees have very different and specialized needs with regard to spectrum and their deployments. For instance, electric utility licensees use spectrum for the operation, maintenance and management of the electricity supply, whereas broadcasters deploy links to connect their studios to transmitters, and commercial mobile wireless service providers, among other uses, to interconnect their cell sites.

The Department, through its policies and technical standards, may designate particular types of systems permitted within certain frequency bands or portions thereof. In its comments, the RABC recommended that the Department limit the amount of spectrum that it designates to specific user groups. The RABC asserted that, by only allowing certain types of applications or users to access a particular band, usage of the band is artificially reduced, leading to spectrum inefficiency.

The Department establishes policies and standards to address licensee requirements, diverse application types and systems, new and rapidly changing technology and accompanying market demands, as well as to support and facilitate access to spectrum. As part of the Department's broad objective, it will continue to maximize the social benefits that Canadians derive from the use of the spectrum, which includes ensuring access to spectrum for particular communications, such as security, sovereignty and public safety needs. As such, the Department will continue to assess and balance the needs of all its licensees and designate priority access to spectrum accordingly, recognizing the varied and sometimes specialized requirements of particular types of systems.

### **8.0 Antenna Standards**

There are many aspects and considerations that influence the design and planning of point-to-point microwave backhaul networks. One such aspect is the antenna and its associated characteristics: gain, half-power beam width, front-to-back ratio, off-axis discrimination and size. Industry Canada defines antenna characteristics to ensure that radio systems are designed not to cause harmful interference to existing licensed systems. In moderately and highly congested areas, the Department requires that licensees deploy antennas with enhanced criteria (improved antenna off-axis discrimination) to maximize the number of systems that can be accommodated. However, in uncongested areas, the Department may relax its criteria for antennas in accordance with the GDP guideline.

In the United States, the FCC, through the Second Report and Order Notice FCC 12-87,<sup>25</sup> recently allowed the use of smaller antennas in the 6 GHz, 18 GHz and 23 GHz frequency bands, but operators are still required to upgrade to antennas with reduced off-axis emissions should interference issues arise that could have been resolved through the initial use of a larger antenna.

In an effort to reduce backhaul costs and promote the growth of broadband, Industry Canada solicited comments on modifying the minimum antenna characteristics, specifically the use of smaller antennas, with a goal of increasing deployments and operators' installation flexibility. The Department also sought comments on whether the proposed usage of smaller antennas would negatively affect existing or future users in the bands by increasing the potential for interference and how best to deal with these concerns.

With significant small cell deployments and cell sites becoming denser, backhaul applications and the equipment necessary to support these sites are evolving. As small cells are foreseen at street level (e.g. lamp poles), in urban areas, small form factors, easy and quick installations are increasingly becoming key design characteristics. In particular, Rogers noted that smaller antennas are less visible, and can be installed on a larger variety of structures.

Overall, the majority of respondents strongly support the use and deployment of small antennas. They highlighted that relaxing the antenna standards to permit the use of smaller antennas will lead to flexible deployments, opportunities for new and innovative backhaul applications, and a reduction in the overall costs of backhaul networks due to lower real estate and lease costs, equipment and installation costs, and a reduced necessity for structural reinforcements (e.g. wind loading). Furthermore, the RABC noted that both the United States and Europe allow the use of smaller antennas. Many respondents, including SaskTel, Shaw and Québecor Média, recommended that Industry Canada align with the new FCC rules allowing smaller antennas for a harmonized North American marketplace. However, TeraGo noted that delays could be introduced in the deployment and operation of higher performing antennas; a limitation of the FCC's mitigation technique of requiring an antenna upgrade when interference issues arise.

The supporting respondents recommended various frequency bands that could benefit from a review of antennas standards with the ultimate goal of permitting smaller antennas. These included the 1.8 GHz, Upper 6 GHz, 11 GHz, 15 GHz, 18 GHz and 23 GHz frequency bands, as well as consideration in the upper frequency bands (e.g. 38 GHz and 42 GHz ranges). Furthermore, Rogers noted that there is already such an antenna ecosystem with one-foot (30 cm) antennas readily available for the 18 GHz band and eight-inch (20 cm) antennas available for the 23 GHz band.

Additionally, with smart grids being deployed across many provinces, linking thousands of remote sites through their point-to-multipoint system, CEA voiced a need for a smaller form, citing the benefits, including a reduction in aesthetic impacts and opportunities for vandalism. TELUS contended that antenna specifications and flexibility be reviewed in frequency bands above 23 GHz, while consideration for smaller antennas in bands below 23 GHz be only granted on a case-by-case basis.

Although the majority recommended modifying the antenna specifications to permit smaller antennas in specific circumstances, ABC Communications and CommScope did not agree. ABC Communications

---

<sup>25</sup> [FCC Report and Order 12-87](#) – *Second Report and Order, Second Further Notice of Proposed Rulemaking, Second Notice of Inquiry, Order on Reconsideration, and Memorandum Opinion and Order*. August 3, 2012.

commented that the current antenna standards are appropriate, whereas CommScope recommended enhanced rather than relaxed antenna masks. Given that spectrum is congested in various geographical areas across Canada and in several frequency bands, CommScope advocated the introduction of two new tighter standards, to allow for increased deployments and reduced congestion levels. Specifically, it recommended that the current SRSP standards be supplemented with: (1) a combination of Industry Canada's Category A and ETSI Class 3 radiation pattern mask; and (2) a typical ETSI Class 4 mask. CommScope further suggested that the use of antennas meeting these new standards be optional and that the Department to provide a fee incentive to encourage their use (e.g. lower fees for licences with antennas meeting the highest (most stringent) performance level, as there would be less impact on the shared public spectrum resource.

Similarly, given the growth in deployments and that certain frequency bands are already congested, SaskTel anticipates that the use of smaller antennas being only feasible in less congested areas. As smaller antennas can increase cases of interference and possibly restrict the deployment of future systems, TeraGo and CBC/Radio-Canada supported a review of minimum antenna characteristics, with a view to allowing smaller antennas in normal and uncongested suburban markets. CBC/Radio-Canada did not support the use of smaller antennas in congested urban markets (e.g. Toronto and Montréal), but preferred larger antennas to maximize spectral efficiency and coordination flexibility.

Acknowledging that smaller antennas have a greater potential for both causing interference and being sensitive to interference through increased off-axis radiation, the RABC and Rogers asserted that by limiting the transmit power through ATPC, along with the use of adaptive modulation, this potential could be reduced. Furthermore, Rogers contended that should these issues arise, they could be adequately addressed within the Department's technical standards (SRSPs). Rogers argued that the use of small antennas is an important consideration in urban areas.

The Department recognizes the many benefits associated with the use of smaller antennas in both urban and rural areas. Specifically, the associated flexibility and cost savings (e.g. fewer tower loading studies, reduction in installation costs and lower site lease rates) will enable spectrum to be utilized more extensively for backhaul, resulting in the provision of more services, likely at lower costs. Consistent with departmental objectives for increased tower sharing, smaller antennas will also provide licensees with more opportunities to access existing structures or infrastructure, such as rooftops or water towers, resulting in less demand for new towers. For the reasons above, the Department has determined that the benefits of permitting smaller antennas outweigh the potential costs.

In addition to providing flexibility through the application of the GDP guideline regarding the use of smaller antennas, the Department will review and redefine antenna characteristics and specifications, with a view to permitting smaller antennas, in consultation with the RABC, through routine SRSP updates. To address the potential for increased congestion and ensure that future systems can be accommodated, the Department will require that smaller antennas be upgraded to higher performance, more directional antennas, should they cause interference to another licensee or prevent the deployment of a new system. Systems employing smaller antennas will be subject to replacement of their antennas should their use prevent the establishment of a new system using a larger, higher performance antenna. The need for replacement of a smaller antenna will be greater in areas of high radiocommunications demand than it will be in areas of low demand. In uncongested areas, the use of smaller antennas with greater off-axis emissions should not likely result in a significant inability to coordinate with existing systems; nor prevent entry of new systems.

**Decision:**

**In addition to the application of the Geographical Differences Policy (GDP) guideline in uncongested areas, the Department will also permit the use of smaller antennas, as defined in future SRSP updates.**

## 9.0 System Capacities

Spectrum policies and standards for all backhaul frequency bands specify the system capacity (e.g. low-, medium-, high-capacity). While transmission technology and microwave system requirements continue to evolve, the Department's capacity definitions, as defined in *SP 1-20 GHz: Revisions to Microwave Spectrum Utilization Policies in the Range of 1-20 GHz*, have not changed since January 1995. As the need for additional backhaul radio transmissions continues to increase, licensees and manufacturers are trying to derive as much capacity as possible from the available spectrum.

There was general consensus that the capacity definitions<sup>26</sup> no longer reflect current traffic throughputs or the evolving increases in system capacities. The capacity definitions were developed when circuit-based traffic was predominantly carried by backhaul to support cellular, long distance and public-switched telephone networks (PSTN). Service providers now favour Internet Protocol (IP) and Ethernet-based traffic to accommodate high bandwidth applications and support mobile and fixed broadband networks. MTS noted that Internet usage is asymmetric, with average monthly download traffic about 3-4 times higher than upload traffic. Additionally, advances in technology have resulted in radio equipment being capable of significantly greater capacities. Whereas 50 Mbps was once considered by service providers to be high-capacity, today very few systems are deployed with capacities less than 50 Mbps, noted Shaw. As such, respondents recommended that the capacity definitions be updated to represent the current radio environment, growth in IP network traffic and industry trends.

Many respondents provided revised capacity definitions, but noted that these, too, may need to be updated in the future as traffic increases. Shaw, Rogers, AVIAT and MTS Allstream recommended that capacities be categorized as follows in Table 3, whereas CBC/Radio-Canada noted that the current definitions meet its broadcasting requirements.

---

<sup>26</sup> Industry Canada's current capacity definitions: Low-capacity (LC):  $\geq 1.544$  Mbps and  $\leq 24.704$  Mbps, Medium-capacity (MC):  $>24.704$  Mbps and  $\leq 51.840$  Mbps, High-capacity (HC):  $>51.840$  Mbps.

**Table 3: Recommended revised capacity definitions**

	<b>Low-Capacity (Mbps)</b>	<b>Medium-Capacity (Mbps)</b>	<b>High-Capacity (Mbps)</b>
Shaw Communications	$\geq 1.544$ and $< 51.8$	$\geq 51.8$ and $\leq 155.008$	$> 155.008$
Rogers Communications	$\leq 150$	$> 150$ and $\leq 500$	$> 500$
AVIAT Networks	$\geq 50$ and $\leq 100$	$> 100$ and $\leq 150$	$> 150$
MTS Allstream	$\geq 1.544$ and $< 25$ (remain the same)	Update to reflect links supporting 100 Mbps -1 Gbps	
CBC/Radio-Canada	$\geq 1.544$ and $\leq 24.704$	$> 24.704$ and $\leq 51.840$	$> 51.840$

As previously noted by the majority of service providers, there is a growing trend towards increasing capacity, up to 1 Gbps, especially in urban and suburban areas. Service providers contend that larger channel bandwidths (e.g. 60 MHz and 80 MHz) will likely be required to support these capacity increases. As such, TELUS, the RABC, Bell Mobility, SaskTel and Québecor Média recommended that system capacities be categorized in terms of bandwidth rather than throughput, as noted in Table 4, and harmonized with the spectral efficiencies as defined within the technical standards.

**Table 4: Recommended revised capacity definitions based on bandwidth**

	<b>Small Bandwidth (MHz)</b>	<b>Medium Bandwidth (MHz)</b>	<b>Large Bandwidth (MHz)</b>	<b>Very Large Bandwidth (MHz)</b>
TELUS, RABC, Bell Mobility, SaskTel and Québecor Média	$\leq 10$	$> 10$ and $\leq 30$	$> 30$ and $\leq 60$	$> 60$

Furthermore, the RABC indicated in its comments that capacity definitions should be the subject of a major study with external expertise, taking into account increases in capacities, growth of IP traffic and the treatment in other countries.

Although the trend is toward systems with ever-increasing capacities, low- and medium-capacity systems have played an important role in the early stages of network development and in extending deployment into rural areas. CBC/Radio-Canada, MTS Allstream and AVIAT indicated a continuing need and voiced support for frequency bands that are dedicated to LC and MC point-to-point links. MTS Allstream noted that the identification of LC and MC specific bands will prevent HC systems from consuming all available bandwidth. Other wireless service providers recommended that there be no capacity limits imposed on frequency bands, rather only what the bandwidth can sustain. Specifically, SaskTel recommended that HC systems be allowed in any band provided that they conform and use the specified bandwidths. Rogers also highlighted that by allowing higher capacities, greater spectral efficiencies are promoted.

Industry Canada recognizes that capacities over microwave backhaul networks have increased dramatically over the past few years and continue to grow. As spectrum management continues to focus more on the efficient use of channels and spectral efficiencies, the need for defined capacities is reduced. As such, the Department will rely on indirect limits to system capacity (e.g. channel sizes and bandwidths rather than explicit capacity requirements).

**Decision:**

**The Department will remove references to, and definitions of, low-, medium- and high-capacity from all fixed service microwave point-to-point backhaul frequency bands above 960 MHz.**

**The Department may apply other techniques to implement the objectives originally intended by these definitions within specific frequency bands.**

The Department also recognizes that there are some applications that use inherently low bandwidths and that spectrum is needed to support these low-capacity systems. However, technology has advanced to the point where medium- and high-capacity systems occupy less bandwidth. This advancement enables these systems to utilize the same size bandwidth as past low- and medium-capacity systems.

Given the previous decision and for all the reasons stated above, the Department will rely on channel sizes as outlined in technical standards, to ensure that there is sufficient spectrum available for all types of applications and systems, including those that are not data-intensive. By not restricting capacity, the overall usage of the spectrum will be maximized. The Department will permit systems, regardless of capacity, to have access to all frequency bands provided that they meet the associated technical standards (e.g. channel bandwidth and spectral efficiency).

**Decision:**

**Systems, regardless of capacity, will be permitted within all microwave frequency bands provided that they operate within the prescribed channel bandwidth and conform to all technical standards.**

### **9.1 10 GHz Band (10.55-10.68 GHz)**

In the same vein as the above discussion, the RABC had previously requested that the Department specifically allow MC systems within the 10 GHz band (10.55-10.68 GHz), which is currently designated for LC systems, with channel bandwidths of 1.25 MHz, 2.5 MHz and 5 MHz. There are currently only 638 assignments (319 links) across Canada in the band.

All respondents either supported or did not object to the RABC's request to permit higher capacities in the band, in an effort to maximize its use. Québecor Média also suggested that a new band plan be developed to allow for larger channel bandwidths of 20 MHz and greater, to further increase the band's potential use.

Given the Department's decisions to remove capacity references and permit systems, regardless of capacity, to operate within any microwave frequency band provided that they conform to all technical standards, they will first be implemented within the 10 GHz band. Systems, regardless of capacity, will

be permitted within the band, provided that their operation does not deviate from the channel plan defined in the SRSP, as amended from time to time.

In an effort to ensure that there is sufficient spectrum available for the continued deployment of less data-intensive applications and systems, the Department will not increase the designated channel bandwidths.

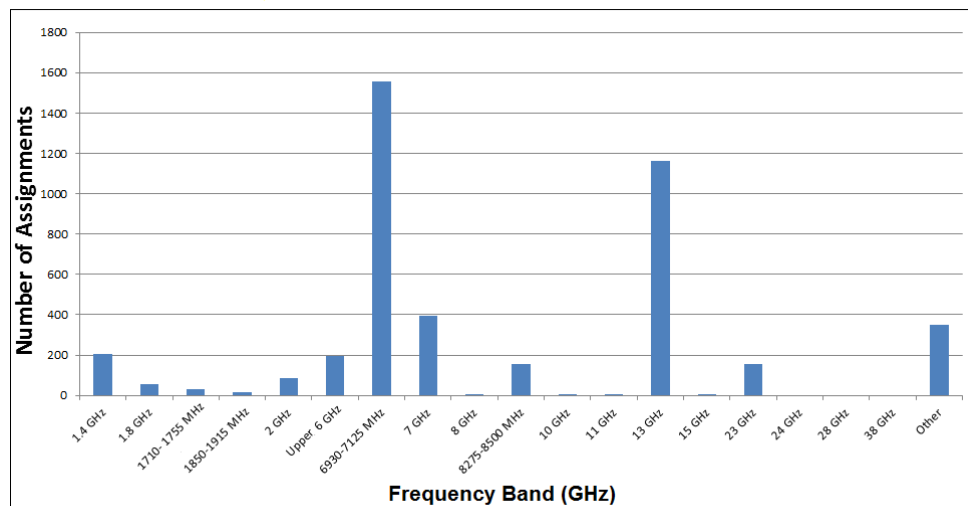
**Decision:**

**The Department will remove the maximum capacity restriction from the 10 GHz band. As such, any point-to-point radio system in the fixed service using digital modulation will be permitted to operate within the frequency band, regardless of capacity, provided that it conforms to the technical requirements of the SRSP.**

## 10.0 Analog Systems

Analog systems generally operate in rural and remote communities, rugged and mountainous terrain or on a non-standard basis. However, this equipment is still being used for certain applications, including studio-transmitter links (STLs), VHCM and ENG systems. There are currently 4,373 assignments using analog equipment above 960 MHz. Although licensees are upgrading some of these applications to make use of new digital equipment, new analog systems are continually being deployed each year. While 75 licensees have operational analog systems, there are 11 majority holders of analog licences.

Few analog systems make use of traditional microwave backhaul bands, apart from bands shared between backhaul and broadcast applications. Appropriately 72% of analog systems in Canada are deployed in the 6930-7125 GHz, 7 GHz and 13 GHz bands. There are also noticeable numbers in the 1.4 GHz frequency range (1427-1452 MHz and 1492-1518 MHz), the Upper 6 GHz band, the band 8275-8750 MHz and the 23 GHz band, as per Figure 3. The majority of these analog assignments are related to broadcast applications.



**Figure 3: Number of analog assignments above 960 MHz**

Broadcasters noted, in their responses, their continued use of analog systems and indicated that this reliance would continue for the foreseeable future. For instance, CBC/Radio-Canada predicted that its 47 analog licences will be in operation for at least the next 10 years. Other licensees also foresee similar usage time frames. Rogers noted that it uses both analog and digital equipment for its broadcasting operations depending on the circumstances.

The majority of respondents, including broadcasters and wireless service providers, strongly recommended that the Department retain analog references in its documentation for as long as these systems remain operational. Shaw further stressed that analog systems should have priority treatment over digital data systems that may be added to a frequency band where there may be interference, in particular the 12.7-13.2 GHz band.

While ABC Communications recognizes that the use of analog systems will continue to exist in areas where conversion to digital may be costly (e.g. rural and remote), it states that the only mention of analog should be in reference to equivalent voice channels when calculating fees. TELUS suggested that the Department develop grandfathering policies to address these legacy systems, and contends that new microwave spectrum policy should focus on digital broadband. Shaw recommended that the Department allow the conversion of existing analog systems to digital systems, within the same amount of bandwidth.

There is a growing trend toward digital conversion within the wireless industry given its extra features and capabilities and spectral efficiencies. While recognizing their inherent spectral efficiencies in comparison to analog, digital ENG systems require slightly larger bandwidths for high-definition (HD) video and even more so for 3D. The Department also acknowledges that, in certain circumstances, there may be benefits of continued analog system use, such as larger coverage, which is key in rural community deployments.

Consistent with the Department’s objective of enhancing the efficient use of spectrum, the Department encourages and promotes the transition from analog to digital equipment. Given the current analog and



digital equipment ecosystem and, in an effort to permit the flexible use of spectrum to the extent possible, the Department supports, but does not mandate, the transition to digital systems. Digital systems will be permitted in all microwave frequency bands, unless specifically stated within the SRSP. Existing analog systems will remain standard where such transmissions are still required. New analog systems will be required to conform to the established criteria for digital systems, as outlined in the respective SRSP.

**Decision:**

**The Department will update its technical rules (SRSP), with a view to removing references to analog operations. Existing analog systems will remain standard.**

## 11.0 Introduction of One-Way Transmissions

Technical standards (SRSPs) define the technical requirements for radio systems operating in frequency bands, as well as their channel plans. Channel plans ensure the orderly and efficient implementation of radio systems. Depending on the nature of the service and application, specific SRSPs may use a two-frequency channel plan or a single frequency plan. Traditional microwave point-to-point backhaul systems, apart from those transporting broadcast programming, use full duplex FDD. However, a single frequency as used for certain applications and links (e.g. STLs), as communications are in a single direction only.

The RABC notes that there is a continuing need for one-way systems for the carriage of broadcasting programs and for applications such as permanent STLs and transportable ENG and TV pick-ups. Given the nature of transportable systems and their licensing over an entire geographical area, the ability to coordinate with other systems is much more difficult. The RABC and Bell Mobility support the continued use of these transportable one-way systems in the bands 6930-7125 MHz and 8275-8500 MHz, and in the upper portion of the 13 GHz band.

AVIAT, Shaw, TeraGo and Rogers do not support the introduction of one-way systems in bands that are already fully utilized with defined FDD plans and argue that this will lead to unused spectrum. Additionally, Rogers noted that since various frequency bands are already congested, the coordination with one-way systems is even more difficult and would further limit frequency reuse. Alternatively, CBC/Radio-Canada strongly supports the introduction of one-way systems, stating that using only what is needed will free up spectrum.

There is support for the continued deployment of one-way systems in bands that are currently allocated for and used by such systems. While some parties felt that there was sufficient spectrum available for STL and TV pick-up operations, should additional spectrum be required, the RABC and TeraGo recommend the exploration of underutilized frequency bands and alignment with the United States. Rogers suggested that the Department consider the combination of one- and two-way systems in newly opened bands, and provided the 28 GHz band as an example. SaskTel noted that the introduction of one- and two-way systems can coexist with appropriate coordination, policy guidelines and licensing.

Consistent with its technology-neutral approach and in an effort to ensuring sufficient spectrum for all types of backhaul applications, the Department will continue to support and designate spectrum for one-way transmissions. While the Department will not universally introduce one-way systems into FDD frequency bands given congestion and other potential technical concerns (increased instances of high-low violations), it will consider their introduction during the policy consultation process of newly designated frequency bands.

## **12.0 Other Issues Raised by Commenters**

Given that technology is evolving, the Department strives to ensure that its policies and technical standards are flexible enough to adapt to new technologies and deployment topologies. There were numerous responses on the need for additional flexibility and other updates to policies and standards to promote the efficient use of wireless backhaul services. These touched on various topics, including licensing approaches, regional licensing practices, channel plans and bandwidths, Spectrum Direct (Industry Canada's Spectrum Management online services website) and coordination requirements.

The Department will continue to determine the most appropriate licensing approach for all types of applications, including backhaul, based on various criteria, such as supply and demand. Regardless of selected authorization approach: site-specific; geographic-based; or licence-exempt, the Department requires applicants to coordinate and cooperate with other licence holders to permit the reasonable and orderly sharing of the spectrum. While the Department acknowledges that there might be some variations in practices with respect to licensing and frequency selection from province to province, this is usually the result of dealing with differences in the local spectrum environment and managing congestion levels. The Department will review its licensing framework, with a view to a more consistent and transparent approach, noting that differences are inevitable as district and regional offices strive to ensure efficient spectrum utilization and address congestion concerns, through licensing.

Spectrum Management's online services website provides public access to information on frequency use within Canada, including the technical and operational data of site-specific licences, for various purposes, such as coordination. Although the Department does not mandate how frequency coordination analysis should be conducted, it does require that it conform to sound engineering practices. Given the many options for performing coordination (e.g. employing a consultant, via an association, even in-house), the Department will continue to require applicants to coordinate to ensure that their proposed system will not cause harmful interference. In this vein, regardless of the licence authorization mechanism, the Department requires licensees to provide current and accurate technical data.

Policy and technical changes arise from the need to respond to new demands, as well as advances in technology. To ensure that Canadians have timely access to new and improved services, the public is invited to advise the Department at any time of issues or concerns. There are many manners in which these requests can be addressed, including the development of a new or updated standards procedure, information circular, technical bulletin, SRSP or a formal consultation process.

### **13.0 Concluding Remarks**

The availability of sufficient backhaul spectrum supports the deployment of wireless broadband services across Canada. With increased demand for new mobile broadband applications, the continued deployment of third and fourth generation wireless services, and increased usage of multimedia and high bandwidth applications, there is a requirement for increased backhaul capacity to accommodate this traffic. The preceding decisions ensure that the Department's regulatory framework addresses Canada's future backhaul needs, including the provision of an additional 2100 MHz of backhaul spectrum, flexibility and the promotion of spectrum efficient technologies. Given the broad nature of these decisions, the Department will incorporate them through revisions to existing spectrum utilization policies, regulations and technical standards.

Furthermore, as part of Industry Canada's commitment to ensuring the efficient operation of radiocommunications in Canada, and to assist it in assessing both traditional and potential new backhaul bands, the Department will continue to monitor current and forecasted trends, ever-changing domestic and international priorities, as well as requests from stakeholders for additional spectrum. This data provides the Department with the necessary information to further its technical and strategic planning functions.

### **14.0 Obtaining Copies**

All spectrum-related documents referred to in this paper are available on the [Spectrum Management and Telecommunications](http://www.ic.gc.ca/spectrum) website at <http://www.ic.gc.ca/spectrum>.

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

Director, Coordination and Terrestrial Engineering  
Engineering, Planning and Standards Branch  
Industry Canada  
300 Slater Street  
Ottawa, Ontario K1A 0C8  
Telephone: 613-990-4770  
Fax: 613-952-5108  
Email: [Spectrum.Engineering@ic.gc.ca](mailto:Spectrum.Engineering@ic.gc.ca)