Innovation, Science and Economic Development Canada
Innovation, Sciences et Développement économique Canada

SMSE-016-18
October 2018

Spectrum Management and Telecommunications

Consultation on the Utilization of the Bands 18.8-19.3 GHz and 28.6-29.1 GHz, and the Bands 17.3-17.7 GHz, 19.3-19.7 GHz and 29.1-29.25 GHz by the Fixed-Satellite Service

Aussi disponible en français — SMSE-016-18

Canada

Contents

1. Intent

1. Through the release of this consultation, Innovation, Science and Economic Development Canada (ISED) seeks to consult on a new spectrum utilization policy for the use of the frequency bands 18.8-19.3 GHz and 28.6-29.1 GHz by the fixed-satellite service (FSS), and on subsequent changes to licensing in the bands. ISED also seeks to consult on changes to the spectrum utilization policy for the use of the frequency bands 17.3-17.7 GHz, 19.3-19.7 GHz and 29.1-29.25 GHz by the FSS.

2. Mandate

2. The Minister of Innovation, Science and Economic Development 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 goals and national policies for spectrum utilization and for ensuring the effective management of the radio frequency spectrum resource.

3. Legislation

3. The Minister of Innovation, Science and Economic Development is provided the general powers for spectrum management in Canada pursuant to section 5 of the *Radiocommunication Act* and sections 4 and 5 of the *Department of Industry Act*. The Governor in Council may make regulations with respect to spectrum management pursuant to section 6 of the *Radiocommunication Act*. These regulations have been prescribed under the *Radiocommunication Regulations*.

4. Policy objectives

4. In developing a spectrum utilization policy for the bands 18.8-19.3 GHz and 28.6-29.1 GHz, and for the bands 17.3-17.7 GHz, 19.3-19.7 GHz and 29.1-29.25 GHz, ISED is guided by the policy objectives of the *Telecommunications Act*, and the *Spectrum Policy Framework for Canada* (SPFC), which states that spectrum should be used in a way that maximizes the economic and social benefits for Canadians. The SPFC also underscores that spectrum policy and management should permit the flexible use of spectrum to the extent possible and support the efficient functioning of markets by harmonizing spectrum use with international allocations and standards, except where Canadian interests warrant a different determination.

5. In addition, ISED is guided by the policy objectives outlined in Radio Systems Policy RP-008, *Policy Framework for Fixed-Satellite Service (FSS) and Broadcasting-*

Satellite Service (BSS). Canada faces unique geographical challenges, including a widely dispersed population and many rural and remote communities. In this context, satellites play a vital role in Canada's telecommunications and broadcasting infrastructure in that they are currently the only means of reaching some of these communities, many of which are located in the North. In licensing commercial satellites, ISED's primary objectives are ensuring that Canadian satellite users have access to the satellite capacity they need to carry out their respective functions and that services are available throughout Canada, including the North.

5. New spectrum utilization policy for the use of the bands 18.8-19.3 GHz and 28.6-29.1 GHz

5.1 Context

6. There are several trends that are impacting the satellite industry. Businesses, governments and consumers are demanding ubiquitous, low-latency broadband connectivity—aboard planes, on ships, and in rural and remote areas. Next-generation geostationary orbit (GSO) satellites and non-geostationary orbit (NGSO) satellites are expected to play an important role in enabling such connectivity and bridging the digital divide between rural and urban areas; they already play a role in supporting terrestrial services and applications such as cellular backhaul, the Internet of Things, and maritime and aviation tracking.

7. One of the key challenges that regulators face is ensuring that international and domestic frameworks provide regulatory certainty for existing service providers, while enabling innovation and the provision of new services and applications. Both GSO satellites and NGSO satellite constellations offer great potential for delivering high-speed Internet connectivity and innovative services and applications for all Canadians, with NGSO satellites offering coverage in the Far North of Canada. Many satellite operators are looking to the broader Ka band (30/20 GHz) to offer such innovative services and applications. Table 1 details the sub-bands included in the broader Ka band.

Table 1: Sub-bands included in the broader Ka band

Band	Sub-band (space-to-Earth)	Sub-band (Earth-to-space)
Extended Ka	17.7-18.3 GHz	27.5-28.35 GHz
	18.3-18.8 GHz	28.35-28.6 GHz /29.25-29.5 GHz
Ka	19.7-20.2 GHz	29.5-30.0 GHz
Other Ka	18.8-19.3 GHz	28.6-29.1 GHz

8. Currently, a number of GSO and NGSO satellite providers are authorized to operate on a non-standard basis in the bands 18.8-19.3 GHz and 28.6-29.1 GHz, and a number of other operators have expressed interest in applying for authorizations to

operate in these bands. To provide regulatory certainty to both existing and future licensees, a spectrum utilization policy is needed for these bands.

5.2 Background: Previous consultations and decisions concerning the bands 18.8-19.3 GHz and 28.6-29.1 GHz in Canada

9. To accommodate interest in the use of NGSO satellites in the fixed-satellite service, the International Telecommunication Union (ITU) 1995 World Radiocommunication Conference (WRC-95) identified spectrum for NGSO systems in the bands 18.8-19.3 GHz (space-to-Earth) and 28.6-29.1 GHz (Earth-to-space). In these bands, both NGSO systems and GSO networks in the FSS have equal status internationally, whereas in all other FSS bands, NGSO systems must protect GSO networks.

10. In 2002, ISED published the *Consultation on Revisions to Spectrum Utilization Policies in the 3-30 GHz Frequency Range*. In this consultation, ISED noted that the United States domestic designations differentiated between GSO and NGSO implementations in the FSS in these bands, while those in Europe did not. (See the European Radiocommunications Committee's decision on the 18 GHz band and the Electronic Communications Committee's decision on the 28 GHz band for reference.) Comments were sought on whether it was necessary to develop domestic rules for implementing NGSO FSS systems. ISED also sought comments on placing a moratorium on the licensing of new terrestrial fixed services in the bands 18.8-19.3 GHz and 28.6-29.1 GHz.

11. In 2004, ISED published the Spectrum Utilization Policy SP 3-30 GHz, *Revision to Spectrum Utilization Policies in the 3-30 GHz Frequency Range and Further Consultation*. This policy gave the FSS priority over the fixed service (FS) in the bands 18.8-19.3 GHz and 28.6-29.1 GHz, without making a distinction in priority between GSO networks and NGSO systems in the FSS. ISED noted the importance of aligning spectrum use within the North American marketplace and across the Americas for satellite services, recognizing that the licensing activities of regional FSS systems in other countries, particularly those in the United States, would have an impact on how the spectrum would be designated for a number of new FSS systems. However, ISED chose to wait for the usage of these bands to mature before deciding on whether to prioritize GSO networks or NGSO systems in the FSS.

12. SP 3-30 GHz also placed a moratorium on the licensing of new FS systems in these bands, and put in place a 10-year transition period (from 2004 to 2014) for which existing FS systems in the 18.8-19.3 GHz band would maintain their co-primary status with FSS. At the end of the transition period, any remaining licensed FS systems would be allowed to continue utilizing the band on a no-interference basis regarding FSS systems. With transmissions in the space-to-Earth direction, earth stations would be susceptible to interference from the FS, but would not cause interference to the FS. As there were no FS systems authorized in the 28.6-29.1 GHz band at the time, no transition

measures were required. As of October 2018, there were 34 FS transmitting stations throughout Canada within the 18.8-19.3 GHz band. Existing stations are listed in annex A.

13. In 2010, ISED issued the Spectrum Advisory Bulletin SAB-003-10, *Use of the Frequency Bands 18.8-19.3 GHz and 28.6-29.1 GHz by the Fixed-Satellite Service (FSS)*, which provided an update on the implementation of FSS in these bands. ISED noted that a number of satellite entities had expressed interest in gaining access to the bands 18.8-19.3 GHz and 28.6-29.1 GHz for the deployment of GSO FSS networks and requested that ISED launch a public consultation to develop a spectrum utilization policy for these bands.

14. In SAB-003-10, it was noted that these bands remained underutilized in North American markets, but that in the United States, the Federal Communications Commission (FCC) had granted authorizations to both GSO networks and NGSO systems in the FSS. As in 2004, ISED recognized the importance of aligning satellite spectrum use in North America, but decided to continue monitoring the development of NGSO FSS systems as there was no commercial use at the time.

15. Since the release of SAB-003-10, ISED has issued authorizations to both GSO and NGSO operators in the FSS for use of the bands on a non-standard basis, without prejudice to the development of future spectrum policies. (See Radio Systems Policy RP-Gen, *General Spectrum Policy Principles and Other Information Related to Spectrum Utilization and Radio Systems Policies*, for information on non-standard licences.) As of October 2018, there are three Canadian GSO and three Canadian NGSO satellite authorizations in the bands 18.8-19.3 GHz and 28.6-29.1 GHz, with five foreign GSO satellites and one foreign NGSO system approved for use in Canada. Lists of these systems can be found on ISED's Authorized and Approved Satellite Services website. A list of the receiving gateway earth stations associated with these systems is shown in annex B. In addition, over 150 000 subscriber terminals have been authorized to operate throughout Canada in the broader Ka band, and there are more than 100 maritime and aeronautical terminals licensed in these bands. The majority of these terminals operate with GSO networks, but some maritime terminals operate with an NGSO system.

5.3 Allocations and utilization

5.3.1 International

16. The 18.8-19.3 GHz band is allocated to the fixed, fixed-satellite (space-to-Earth) and mobile services on a co-primary basis. Similarly, the 28.6-29.1 GHz band is allocated to the fixed, fixed-satellite (Earth-to-space) and mobile services on a co-primary basis, as shown in tables 2 and 3. The FSS allocations in these bands are subject to the ITU's *Radio Regulations* (RR) provision No. **5.516B**, which identifies specific bands for use by high-density applications in the FSS, and provision No. **5.523A**, which states that the use of these bands by GSO networks and NGSO systems in the FSS is subject to the

application of provision No. **9.11A** and that provision No. **22.2** does not apply.

17. Provision No. **9.11A** requires NGSO systems to coordinate with GSO networks and vice-versa. ISED notes that the term "coordination" has long been associated with the access afforded to systems sharing a band on an equitable first-come, first-served basis. During the coordination process, responsibilities and obligations are placed on both parties so that the use of spectrum by multiple players is maximized.

18. Provision No. **22.2** states that NGSO systems operate on a no-interference, no-protection basis with respect to GSO networks in the fixed-satellite and broadcasting-satellite services. As No. **22.2** does not apply in the bands 18.8-19.3 GHz (space-to-Earth) and 28.6-29.1 GHz (Earth-to-space), NGSO systems have equal status with respect to GSO networks in the FSS.

Table 2: International frequency allocations for the 18.8-19.3 GHz band

Region 1	Region 2	Region 3
18.8-19.3 GHz FIXED FIXED-SATELLITE (space-to-Earth) 5.516B 5.523A MOBILE		

Table 3: International frequency allocations for the 28.6-29.1 GHz band

Region 1	Region 2	Region 3
28.5-29.1 GHz FIXED FIXED-SATELLITE (Earth-to-space) 5.484A 5.516B 5.523A 5.539 MOBILE Earth exploration satellite (Earth-to-space) 5.541 5.540		

5.3.2 Canada

19. The *Canadian Table of Frequency Allocations* (CTFA) establishes the frequency allocations available for radio services in Canada. The CTFA is based both on the provisions of the Final Acts resulting from the various World Radiocommunication Conferences convened by the ITU and the results of Canadian policy decisions.

20. Table 4 is an excerpt from the CTFA that provides the allocations and footnotes for the bands 18.8-19.3 GHz and 28.6-29.1 GHz. In addition to the provisions Nos. **5.516B** and **5.523A** discussed above, Canadian domestic footnotes **C16E** and **C16F** give

FSS priority over FS in these bands and specify that domestic spectrum utilization policies, to be developed at a later date, will govern FSS use of the bands.

Table 4: Canadian frequency allocations for the bands 18.8-19.3 GHz and 28.6-29.1 GHz

18.8 - 19.3 GHz FIXED FIXED-SATELLITE (space-to-Earth) 5.516B 5.523A C16E
28.5 - 29.1 GHz FIXED FIXED-SATELLITE (Earth-to-space) 5.484A 5.516B 5.523A 5.539 MOBILE 5.540 C16F

5.3.3 United States

21. In its 1996 First Report and Order (FCC Docket No. 92-297), the FCC designated the 28.6-29.1 GHz band for use by NGSO FSS systems on a primary basis and GSO FSS networks on a secondary basis. Similarly, the downlink portion in the 18.8-19.3 GHz band was allocated for FSS use only and was limited to space-to-Earth use by NGSO FSS systems.

22. In December 2016, the FCC issued a consultation on its rules governing NGSO FSS deployments in the broader Ka band. In its Notice of Proposed Rulemaking, the FCC put forward two proposals with respect to the bands 18.8-19.3 GHz and 28.6-29.1 GHz:

1) to allow GSO FSS operation in the 18.8-19.3 GHz downlink band on an unprotected, non-interference basis with respect to NGSO FSS systems, which would match the secondary GSO FSS designation in the paired 28.6-29.1 GHz uplink band; or
2) to harmonize with international rules and give GSO operations co-primary status with NGSO operations in these bands.

23. In September 2017, the FCC published its Report and Order, which allows GSO operations on an unprotected, non-interference basis and retains primary status for NGSO operations in the 18.8-19.3 GHz band. In its decision, the FCC acknowledged that in all other bands, NGSO FSS systems must protect GSO FSS and GSO broadcasting-satellite service (BSS) networks. Granting NGSO FSS systems primary status in the bands 18.8-

19.3 GHz and 28.6-29.1 GHz would provide NGSO operators greater flexibility in deployment and coordination discussions. These rules are not harmonized with the international rules. Tables 5 and 6 summarize the U.S. allocations in the bands 18.8-19.3 GHz and 28.6-29.1 GHz, which are found in the *FCC Online Table of Frequency Allocations*. Of note, footnote NG165 stipulates that GSO satellite networks in the FSS shall not cause harmful interference to, or claim protection from, NGSO satellite systems in the FSS in the bands 18.8-19.3 GHz and 28.6-29.1 GHz.

Table 5: U.S. frequency allocations for the 18.8-19.3 GHz band

International Table			United States Table	
Region 1 Table	**Region 2 Table**	**Region 3 Table**	**Federal Table**	**Non-Federal Table**
18.8-19.3 GHz FIXED FIXED-SATELLITE (space-to-Earth) 5.516B 5.523A MOBILE			**18.8-20.2 GHz** FIXED-SATELLITE (space-to-Earth) US334 G117 US139	**18.8-19.3 GHz** FIXED-SATELLITE (space-to-Earth) NG165 US139 US334

Table 6: U.S. frequency allocations for the 28.6-29.1 GHz band

International Table			United States Table	
Region 1 Table	**Region 2 Table**	**Region 3 Table**	**Federal Table**	**Non-Federal Table**
28.5-29.1 GHz FIXED FIXED-SATELLITE (Earth-to-space) 5.484A 5.516B 5.523A 5.539 MOBILE Earth exploration satellite (Earth-to-space) 5.541 5.540			**27.5-30 GHz**	**28.35-29.1 GHz** FIXED-SATELLITE (Earth-to-space) NG165 NG62

5.3.4 Europe

24. The *European Table of Frequency Allocations and Applications in the Frequency Range 8.3 kHz to 3000 GHz* (ECA Table) specifies the harmonized European frequency allocations. The harmonized FSS use of the bands is governed by the European Conference of Postal and Telecommunications Administrations' (CEPT) Electronic Communications Committee (ECC) harmonization measures ERC Decision (00)07 and

ECC Decision (05)01. Although both measures establish sharing and partitioning criteria for the FS and FSS use of the bands 18.8-19.3 GHz and 28.6-29.1 GHz, neither differentiates between use by GSO networks and NGSO systems in the FSS. Table 7 summarizes the allocations in the bands for Europe.

Table 7: European frequency allocations for the bands 18.8-19.3 GHz and 28.6-29.1 GHz

European common allocation	ECC/ERC harmonisation measures	Applications
18.8-19.3 GHz FIXED FIXED-SATELLITE (space-to-Earth) 5.523A	ERC/DEC/(00)07 ERC/REC 12-03	Fixed links
	ERC/DEC/(00)07	FSS
28.5-29.1 GHz FIXED FIXED-SATELLITE (Earth-to-space) 5.484A 5.516B 5.539 5.523A Earth exploration-satellite (Earth-to-space) 5.541 5.540		Feeder links
	ECC/DEC/(05)01 T/R 13-02	Fixed links
	ECC/DEC/(05)01	FSS
	ECC/DEC/(05)01 ECC/REC/(11)01	Fixed Wireless Access

5.4 FSS use of the bands 18.8-19.3 GHz and 28.6-29.1 GHz

5.4.1 Status of GSO networks and NGSO systems in the FSS

25. As stated in SAB-003-10, a number of satellite entities expressed interest to ISED in gaining access to the bands 18.8-19.3 GHz and 28.6-29.1 GHz for the deployment of GSO FSS networks. In the past few years, ISED has also authorized NGSO FSS operations in these bands. As there are now NGSO systems and GSO networks authorized in these bands on a non-standard basis, ISED is of the view that a spectrum utilization policy is needed to address the regulatory status of both types of systems. Moreover, such a policy would allow the establishment of a licensing and technical framework for future deployments.

26. Given the emergence of NGSO FSS systems, the international regulatory framework, recent U.S. decisions, and current authorizations for both GSO networks and NGSO systems, ISED did not consider the option of making GSO networks primary and NGSO systems secondary. Rather, ISED evaluated the following two options:

1) co-primary status for GSO networks and NGSO systems in the FSS; or
2) primary status for NGSO systems and secondary status for GSO networks in the FSS.

27. Option 1, giving equal status to GSO networks and NGSO systems in the FSS, would align with Canada's current practice. Although not standard at this time, both GSO networks and NGSO systems in the FSS have been authorized on an equal basis in the bands 18.8-19.3 GHz and 28.6-29.1 GHz. Option 1 would provide business continuity to the numerous systems that have been authorized to date. Moreover, allowing both NGSO systems and GSO networks in the FSS to function on an equal basis would increase the potential for new and innovative communication services in rural and remote areas that have been underserved by terrestrial networks, thereby benefiting Canadians living in these areas. This approach is also consistent with the SPFC, which promotes harmonizing spectrum use with international allocations and rules when appropriate.

28. Harmonizing spectrum use with current U.S. rules, option 2, would give NGSO systems primary status and GSO networks secondary status in these bands. This option would provide NGSO FSS systems dedicated bands where they would have operational priority over GSO FSS networks. Such an approach is consistent with ISED's long-standing recognition of the importance of aligning spectrum use regionally, particularly for satellite services, but is not viewed as a significant factor in this case. While regional alignment may facilitate coordination for GSO FSS networks, this is not as beneficial for NGSO FSS systems, which are global in nature.

29. Option 2 would give secondary status to current GSO licensees in these bands, creating uncertainty for GSO FSS networks currently being planned or deployed, as they would no longer be able to claim protection from interference.

30. Having analyzed both options, ISED is proposing to give co-primary status to GSO networks and NGSO systems in the FSS in the bands 18.8-19.3 GHz and 28.6-29.1 GHz (option 1). ISED has already issued many authorizations for the operation of satellites, gateway stations, and subscriber terminals. Giving these operations co-primary status would provide business continuity to existing licensees in these bands, whereas option 2 would be disruptive to licensees' plans and service offerings. ISED notes that both GSO and NGSO satellite operators are implementing new communications technologies in FSS bands that will benefit Canadians living in rural and remote areas; allowing both types of systems to operate on a co-primary basis will further support the provision of such services.

31. ISED notes that regardless of the approach taken domestically, Canadian licensees would still be required to coordinate their GSO networks and NGSO systems with those of other administrations.

32. Proposed changes to the CTFA to reflect co-primary status for both types of FSS systems are shown in section 9.2.

Question 1: ISED is seeking comments on the proposal to give co-primary status to both GSO networks and NGSO systems in the FSS in the bands 18.8-19.3 GHz and 28.6-29.1 GHz.

5.4.2 Status of incumbent FSS licensees

33. ISED has implemented a first-come, first-served licensing policy to process applications from prospective satellite operators that are ready to use the spectrum at the requested GSO orbital positions or NGSO orbits. This policy and the bands to which it applies are laid out in RP-008.

34. Should the proposal in question 1 be adopted, the conditions of licence for existing non-standard authorizations will be amended to remove references to operation on a no-interference, no-protection basis, and references to licensees being subject to future policy changes. The dates of the original authorizations will be used as the basis for continued domestic coordination for the amended licences. For foreign systems authorized for use in Canada, coordination would be based on standard international practices. Essentially, this would mean no change from the existing status of licensees or approved systems, which would provide business continuity for FSS providers.

Question 2: ISED is seeking comments on the proposal to use the original date of authorization for domestic systems for domestic coordination purposes.

5.4.3 Domestic coordination

35. GSO operators have many years' experience in coordinating their networks, which has led to established coordination practices. Since NGSO systems must protect GSO networks in other portions of the Ka band, technical criteria have been established and are well understood by NGSO operators.

36. As acknowledged in the *Consultation on the Licensing Framework for Non-Geostationary Satellite Orbit (NGSO) Systems and Clarification of Application Procedures for All Satellite Licence Applications* (NGSO Consultation), there is currently a lack of established coordination practices and experience in coordination between NGSO systems. This is also the case for coordination between co-primary GSO networks and NGSO systems.

37. In recognition of the uncertain coordination environment between NGSO systems, the NGSO Consultation sought stakeholder views on two possible mandatory

mechanisms that could be implemented in the event of unsuccessful domestic coordination between NGSO systems:

1) the imposition of spectrum sharing during in-line interference events, which occur when an NGSO satellite is directly between an earth station and another NGSO satellite; and
2) the mandated use of a third-party dispute resolution process.

38. In the *Decisions on the Licensing Framework for Non-Geostationary Satellite Orbit (NGSO) Systems and Clarification of Application Procedures for All Satellite Licence Applications* (NGSO Decisions), ISED decided not to pursue mandated third-party dispute resolution given limited support from stakeholders. ISED also deferred a decision on mandatory spectrum sharing during in-line events because, at the time of publishing the NGSO Decisions, spectrum sharing between NGSO systems was the subject of an on-going consultation in the United States.

39. The FCC has since concluded in its Report and Order and Further Notice of Proposed Rulemaking (R&O/FNPRM), *Updating Rules for Non-Geostationary-Satellite Orbit Fixed-Satellite Service Constellations*, that the status of GSO operations in the bands is secondary and that GSO networks are not entitled to protection from interference caused by NGSO systems. In other words, GSO networks must protect NGSO systems. The R&O/FNPRM also updated the rules governing spectrum sharing between NGSO systems. In the absence of coordination agreements, NGSO FSS systems will now be required to divide their commonly authorized spectrum when the change in system noise temperature caused by interference, or $\Delta T/T$, equals 6%. The FCC expects that operators will negotiate coordination agreements in good faith to maximize the use of spectrum and avoid triggering the default sharing mechanism.

40. ISED takes note of the FCC's decisions governing sharing between NGSO systems in the absence of coordination agreements, but is not currently planning to implement mandatory spectrum sharing measures in the event of coordination disputes, either between NGSO systems or between NGSO systems and GSO networks.

41. While coordination between co-primary GSO networks and NGSO systems may be more complex, ISED notes that GSO networks can implement some technical measures such as off-axis e.i.r.p limits to improve the sharing environment in the bands 18.8-19.3GHz and 28.6-29.1 GHz and reduce the coordination burden on NGSO systems. Similarly, NGSO systems can implement mitigation measures such as earth-station site diversity and orbital avoidance angles to improve the sharing environment between different NGSO systems operating co-frequency.

42. ISED will continue to apply the ITU's general coordination practices to domestic coordination as outlined in the NGSO Decisions, using the domestic authorization date to establish the date of regulatory precedence as per departmental practice. ISED expects both GSO and NGSO operators to negotiate in good faith to accommodate each other's operations. ISED will also continue to work through the ITU process to identify and

develop best practices for coordination between GSO networks and NGSO systems.

43. All satellite licensees have conditions of licence that require licensees to undertake coordination activities, state that ISED may impose the implementation of mitigation techniques, and require the licensee to comply with all measures imposed by the Department. Those measures include, but are not limited to, spectrum sharing and frequency segmentation. ISED is of the view that, at this time, this existing domestic coordination approach is sufficient to address coordination disputes without the need to specify mandatory measures. Given the increasingly complex coordination environment and the number of new operators, ISED will be publishing additional information on its domestic coordination approach.

Question 3: Is there additional information on coordination practices for GSO networks and NGSO systems in the FSS that should be considered? If so, please explain in detail.

Question 4: ISED seeks comments on its view that, at this time, the existing approach to addressing domestic coordination disputes is sufficient.

5.5 Other considerations

5.5.1 FS use of the bands 18.8-19.3 GHz and 28.6-29.1 GHz

44. As discussed above, the SP 3-30 GHz policy published in 2004 included a moratorium on the licensing of new FS systems in the bands 18.8-19.3 GHz and 28.6-29.1 GHz until there was a better definition of the kinds of fixed services that could be implemented with minimal constraints on the FSS. At that time, there were a number of FS systems authorized via annual radio licences operating in the 18.8-19.3 GHz band, but there were no FS licensees in the 28.6-29.1 GHz band. Modifications to existing FS systems that did not increase the potential for interference to the FSS were authorized on a case-by-case basis in the 18.8-19.3 GHz band.

45. FS systems operating in the 18.8-19.3 GHz band were subject to a set of transition provisions, which are outlined in the SP 3-30 GHz policy. No transition policy was implemented for the 28.6-29.1 GHz band as there were no FS licensees at that time.

46. From 2004 to 2014, both FSS and FS systems operated on a co-primary basis. Since 2014, licensed FS systems operate in the 18.8-19.3 GHz band on a no-interference basis with respect to FSS systems. There have been no requests from FSS licensees to displace FS stations. However, FSS systems have only been lightly deployed in these bands to date, and more systems are being implemented to meet the increasing demand for mobile and fixed broadband data services in rural and remote areas.

47. Footnote **5.516B** of the *Radio Regulations* identifies the bands 18.8-19.3 GHz and 28.6-29.1 GHz for high-density FSS deployments. Canada adopted this footnote in the CTFA in 2005. Further, ISED has licensed subscriber terminals to operate ubiquitously under an authorization and licensees are not required to notify ISED of the location of individual terminals, unless specifically requested to do so. As the ubiquitous deployment of FSS terminals increases, coordination with individual FS radio stations becomes less feasible.

48. ISED is maintaining the existing SP 3-30 GHz policy with respect to FS systems in the bands 18.8-19.3 GHz and 28.6-29.1 GHz, as it continues to be relevant.

5.5.2 Revisions to the Canadian Table of Frequency Allocations

49. ISED is proposing to update the status of the FS allocation to the fixed service from primary to secondary in the CTFA, as per existing policy.

50. ISED is also proposing to reflect the implementation of a new spectrum utilization policy in the bands by modifying footnotes C16E and C16F, as shown in table 8 and the text that follows. Modifications are shown by ~~strikethroughs~~ (for deletions) and underlines (for additions).

Table 8: Proposed changes to the Canadian frequency allocations for the bands 18.8-19.3 GHz and 28.6-29.1 GHz

18.8 - 19.3 ~~FIXED~~ FIXED-SATELLITE (space-to-Earth) 5.516B 5.523A Fixed MOD C16E
28.5-28.6 FIXED FIXED-SATELLITE (space-to-Earth) 5.484A 5.516B 5.539 MOD C16F
28.6 - 29.1 ~~FIXED~~ FIXED-SATELLITE (Earth-to-space) ~~5.484A~~ 5.516B 5.523A 5.539 MOBILE Fixed 5.540 MOD C16F

MOD
C16E (CAN-18) In the frequency band 18.3~~-19.3~~ 18.8 GHz, the use of this band by the fixed-satellite service has priority over the use by the fixed service. Use of this band by the fixed service ~~in~~ shall be limited to applications that pose minimal constraints on the deployment of fixed-satellite services. ~~Domestic implementation of fixed-satellite services in the band 18.8-19.3 GHz will be governed by spectrum utilization policies to be developed. These policies will take regional developments into consideration in the designation and authorization of spectrum for particular systems and technologies.~~ The band 18.8-19.3 GHz is designated for use by both GSO networks and NGSO systems in the FSS on a co-primary basis.

MOD
C16F (CAN-18) In the frequency bands 28.35~~-29.1~~ 28.6 GHz and 29.25-29.5 GHz, the use of these bands by the fixed-satellite service has priority over the use by the fixed service. Use of these bands by the fixed service shall be limited to applications that pose minimal constraints on the deployment of fixed-satellite services. ~~Domestic implementation of fixed-satellite services in the band 28.6-29.1 GHz will be governed by spectrum utilization policies to be developed. These policies will take regional developments into consideration in the designation and authorization of spectrum for particular systems and technologies.~~ The band 28.6-29.1 GHz is designated for use by both GSO networks and NGSO systems in the FSS on a co-primary basis.

Question 5: ISED is seeking comments on the proposed changes to the CTFA.

In providing responses, include supporting arguments for or against the proposed changes.

5.5.3 Technical rules

51. As radio technologies change, ISED may develop technical rules, as appropriate, to facilitate sharing of the bands by current and future authorized users. These rules would be developed in consultation with stakeholders, including the Radio Advisory Board of Canada, at a later date.

6. Changes to the spectrum utilization policy for the use of the bands 17.3-17.7 GHz, 19.3-19.7 GHz and 29.1-29.25 GHz

6.1 Context: Review of certain footnotes limiting the use by the FSS to feeder links for other services

52. In April 2018, ISED received a request from Ciel Satellite Limited Partnership on behalf of itself and its affiliates (collectively “the Companies”), seeking changes to

certain footnotes in the CTFA related to the use of the bands 17.3-17.7 GHz (Earth-to-space/space-to-Earth), 19.3-19.7 GHz (space-to-Earth), and 29.1-29.25 GHz (Earth-to-space) to facilitate the operation of gateway earth station facilities for the FSS in these bands. The footnotes currently limit the use of these bands by the FSS to feeder links for either the broadcasting-satellite service (BSS) or the mobile-satellite service (MSS), depending on the band.

53. The spectrum policies governing the bands 17.3-17.7 GHz, 19.3-19.7 GHz, and 29.1-29.25 GHz were last revised in 2004 when the Department published SP 3-30 GHz. Since then, the services and applications traditionally delivered under the FSS, BSS and MSS allocations have increasingly converged. For instance, Internet-based video services are displacing traditional broadcasting services, while earth stations in motion (ESIMs) communicating with FSS networks are being deployed to meet growing demand for ubiquitous broadband services in the mobility market. As such, ISED believes that there is merit in revisiting Canadian footnotes in these bands that restrict use to a particular satellite service in order to provide greater flexibility and maximize the use of the spectrum in these bands.

6.2 Allocations and utilization

6.2.1 International

54. The 17.3-17.7 GHz band is allocated to the FSS (Earth-to-space) and the BSS on a co-primary basis, as well as to the radiolocation service on a secondary basis, as shown in table 9. Footnote **5.516** further limits the use of the band by the FSS to GSO satellite networks and to feeder links for the BSS. Footnote **5.515** specifies that sharing between the FSS and BSS is governed by appendix **30A,** annex 4, paragraph 1 of the *Radio Regulations*, which requires coordination between transmitting space stations in the FSS or the BSS and receiving space stations in the BSS when the change in system noise temperature due to interference, $\Delta T_s/T_s$, exceeds the threshold value of 6%.

55. The 19.3-19.7 GHz band is allocated to the fixed, fixed-satellite (Earth-to-space) (space-to-Earth) and the mobile services on a co-primary basis as shown in tables 10 and 11. The 29.1-29.5 GHz band is allocated to the fixed, fixed-satellite (Earth-to-space) and mobile services on a co-primary basis. The 29.1-29.5 GHz band is also allocated to the Earth exploration-satellite service on a secondary basis. Footnote **5.540** provides an additional allocation to the FSS (space-to-Earth) in the 27.501-29.999 GHz band on a secondary basis for beacon transmissions intended for uplink power control.

56. In the 19.3-19.7 GHz (Earth-to-space) band, footnote **5.523B** limits the use by the FSS to feeder links for NGSO satellite systems in the MSS, and coordination under No. **9.11A** applies. No limitations apply to GSO networks in the 19.3-19.6 GHz band operating in the space-to-Earth direction. As per footnote **5.535A**, the use of the 29.1-29.5 GHz (Earth-to-space) band by the FSS is limited to GSO networks and to feeder links for NGSO MSS systems. Footnotes **5.523C, 5.523D**, **5.523E** and **5.539** further

specify the conditions under which RR provision No. **22.2** applies to NGSO FSS systems in portions of the bands 19.3-19.7 GHz and 29.1-29.5 GHz. Provision No. **22.2** requires NGSO systems to operate on a no-interference, no-protection basis with respect to GSO systems in the FSS and BSS.

Table 9: International frequency allocations for the 17.3-17.7 GHz band

Region 1	Region 2	Region 3
17.3-17.7 GHz FIXED-SATELLITE (Earth-to-space) 5.516 (space-to-Earth) 5.516A 5.516B Radiolocation 5.514	**17.3-17.7 GHz** FIXED-SATELLITE (Earth-to-space) 5.516 BROADCASTING- SATELLITE RADIOLOCATION 5.514 5.515	**17.3-17.7 GHz** FIXED-SATELLITE (Earth-to-space) 5.516 Radiolocation 5.514

Table 10: International frequency allocations for the 19.3-19.7 GHz band

Region 1	Region 2	Region 3
19.3-19.7 FIXED FIXED-SATELLITE (space-to-Earth) (Earth-to-space) 5.523B 5.523C 5.523D 5.523E MOBILE		

Table 11: International frequency allocations for the 29.1-29.5 GHz band

Region 1	Region 2	Region 3
29.1-29.5 GHz FIXED FIXED-SATELLITE (Earth-to-space) 5.516B 5.523C 5.523E 5.535A 5.539 5.541A MOBILE Earth exploration satellite (Earth-to-space) 5.541 5.540		

6.2.2 Canada

57. Table 12 is an excerpt from the CTFA that provides the allocations and footnotes for the bands 17.3-17.7 GHz, 19.3-19.7 GHz and 29.1-29.5 GHz. In addition to the international footnotes discussed above, Canadian footnote **C43** stipulates that FSS use in the 17.3-17.7 GHz band is limited to feeder links for the BSS operating in the 12.2-12.7

GHz band. Similarly, Canadian footnotes **C46A** and **C48** limit the FSS use of the bands 19.3-19.7 GHz and 29.1-29.25 GHz to feeder links for MSS systems.

58. In the bands 19.3-19.7 GHz and 29.1-29.25 GHz, Canadian footnotes **C16D** and **C16G** give priority to the FS over the FSS, limiting the use by the FSS to applications that pose minimal constraints on the deployment of the FS. In the 29.25-29.5 GHz band, Canadian footnote **C16F** gives priority to the FSS over the FS.

Table 12: Canadian frequency allocations for the bands 17.3-17.7 GHz, 19.3-19.7 GHz and 29.1-29.5 GHz

17.3-17.7 GHz FIXED-SATELLITE (Earth-to-space) 5.516B C43 BROADCASTING-SATELLITE Radiolocation 5.515
19.3-19.7 GHz FIXED FIXED-SATELLITE (space-to-Earth) 5.523C 5.523D 5.523E C46A C16D
29.1-29.5 GHz FIXED FIXED-SATELLITE (Earth-to-space) 5.516B 5.523C 5.523E 5.535A 5.539 5.541A C48 MOBILE 5.540 C16F C16G

6.2.3 Use of the bands 17.3-17.7 GHz, 19.3-19.7 GHz and 29.1-29.25 GHz

59. In the 17.3-17.7 GHz band, there is currently limited BSS use in Canada, with six authorized satellites, detailed in annex C. The development of the Direct Broadcast Satellite (DBS) Service in the reverse band 17.7-17.8 GHz has not progressed as originally anticipated, with equipment not yet widely available. Continued development is uncertain, particularly since market analysis and industry predictions indicate that traditional broadcasting in general will continue to decline as customers switch to Internet-based video services.

60. The Companies have requested the adoption of a new footnote to permit FSS (space-to-Earth) use in the 17.3-17.7 GHz band, not limited to feeder links for BSS,

under the condition that such FSS use not cause more interference, or require more protection from interference, than BSS transmissions in this band. This approach is similar to what is permitted in the 12.2-12.7 GHz band through footnote **5.492**. Even though some level of BSS will remain, ISED is of the view that GSO FSS (space-to-Earth) operations under these conditions would be feasible with sufficient orbital spacing and geographical separation between FSS receiving earth stations and transmitting BSS feeder link earth stations.

61. In the bands 19.3-19.7 GHz and 29.1-29.25 GHz, there is currently limited use in Canada, as shown in annex D. In the 2004 policy SP 3-30 GHz, the Department proposed and later adopted footnotes **C46A** and **C48**, limiting FSS use in the bands 19.3-19.7 GHz and 29.1-29.25 GHz to feeder links for MSS given the priority designation to the fixed service for these bands and the importance of aligning satellite spectrum use within the North American marketplace and the Americas. In particular, SP 3-30 GHz noted that the United States had recently adopted a similar footnote. To date, only Iridium, Inmarsat and Telesat have deployed earth stations in the bands subject to Canadian footnotes **C46A** and **C48**.

62. In their request to ISED, the Companies argue that these Canadian footnotes are at odds with ITU rules stipulated in footnotes **5.523D** and **5.535A**, which also permit GSO FSS use. The Companies have requested that footnotes **C46A** and **C48** be deleted or modified to align with these international footnotes. The Companies note that the use of MSS in these bands is currently limited, and that potential FSS GSO gateway sites could be carefully coordinated to ensure that the MSS use is protected. ISED is of the view that these bands could be used by GSO FSS networks for low-density applications such as gateways and feeder links without constraining other services in the bands.

6.3 Revisions to the Canadian Table of Frequency Allocations

63. In the CTFA, **C43, C46A** and **C48** are the only three Canadian footnotes that limit the use of FSS exclusively to feeder links for other services. In the bands 17.3-17.7 GHz, 19.3-19.7 GHz and 29.1-29.25 GHz, to which these footnotes apply, there are only six licensees, each with a small number of earth stations. Annex D provides the list of licensees.

64. Therefore, ISED proposes to allow use of the 17.3-17.7 GHz band by the FSS (space-to-Earth) and to add the new footnote **C43A** accordingly. It is noted that any Canadian authorizations for use of this band by the FSS (space-to-Earth) would be considered in derogation of the international table of frequency allocations as there is no such allocation in the ITU's *Radio Regulations*. As a result, such use would be subject to RR provision **4.4**, i.e. the condition to operate on a no-harmful interference, no-protection basis with respect to any frequency assignments used in accordance with the RR. ISED also proposes to modify footnotes **C46A** and **C48**, noting that all other footnotes would continue to apply to limit the use of the bands 19.3-19.7 GHz and 29.1-29.25 GHz by GSO FSS networks for low density deployments of earth stations.

65. New FSS systems to be authorized in these three bands would be subject to RP-008, which would be modified to include these bands. As per RP-008, applications would be considered on a first-come, first-served basis and authorizations would be subject to obligations, such as satellite coordination with potentially affected Canadian satellites and terrestrial networks prior to launch.

66. ISED proposes the following changes to the CTFA:

17.3 - 17.7 FIXED-SATELLITE (Earth-to-space) 5.516 C43 BROADCASTING-SATELLITE ADD C43A Radiolocation 5.515

ADD C43A Assignments to stations in the broadcasting-satellite service in the frequency band 17.3-17.7 GHz may also be used for transmissions in the fixed-satellite service (space-to-Earth), provided that such transmissions do not cause more interference, or require more protection from interference, than the broadcasting-satellite service transmissions operating in conformity with the *Radio Regulations*. The use of these assignments by the fixed-satellite service (space-to-Earth) is limited to low density deployments of earth stations communicating with geostationary satellite systems.

19.3 - 19.7 FIXED FIXED-SATELLITE (space-to-Earth) 5.523C 5.523D 5.523E MOD C46A C16D

C46A (CAN-18) MOD The use of the frequency band 19.3-19.7 GHz by the fixed-satellite service (space-to-Earth) is limited to low density deployments of earth stations communicating with geostationary satellite systems and to feeder links to non-geostationary satellite systems in ~~for~~ the mobile-satellite service.

29.1 - 29.5
FIXED FIXED-SATELLITE (Earth-to-space) 5.516B 5.523C 5.523E 5.535A 5.539 5.541A MOD C48 MOBILE 5.540 C16F C16G

C48 (CAN-18) MOD The use of the frequency band 29.1-29.25 GHz by the fixed-satellite service (Earth-to-space) is limited to low-density deployments of earth stations communicating with geostationary satellite systems and to feeder links to non-geostationary satellite systems in ~~for~~ the mobile-satellite service.

Question 6: ISED is seeking comments on the above proposed changes to the CTFA.

In providing responses, include supporting arguments for or against the proposed changes.

7. Next steps

67. ISED will review comments and publish a decision on the spectrum utilization policies for the bands discussed in this consultation. With respect to section 5, once a decision on a spectrum utilization policy is made, ISED will review the conditions of licence of licensees with approval to use the bands on a non-standard basis and, where appropriate, change those conditions to reflect standard use of the bands. ISED will also rescind SAB-003-10. With respect to section 6, once a decision on spectrum utilization policies is made, ISED will publish a revision to the CTFA.

8. Submitting comments

68. Respondents are requested to provide their comments in electronic format (Microsoft Word or Adobe PDF) by email.

69. Respondents are asked to specify question numbers for ease of referencing and to provide supporting rationale for each response.

70. Paper submissions can be mailed to:

Director
Space Services Planning
Innovation, Science and Economic Development Canada
235 Queen Street
Ottawa, Ontario K1A 0H5

71. All submissions should cite the *Canada Gazette*, Part I, the publication date, the title and the notice reference number (SMSE-0196-18). Parties should submit their comments no later than January 7, 2019, to ensure consideration. Soon after the close of the comment period, all comments received will be posted on ISED's Spectrum Management and Telecommunications website.

72. ISED will provide interested parties with the opportunity to reply to comments from other parties. Reply comments will be accepted until February 11, 2019.

73. All comments and reply comments will be published, so those making submissions are asked not to provide confidential or private information in their submissions.

74. Following the initial comment period, ISED may, at its discretion, request additional information to clarify significant positions or new proposals. Should additional information be requested, the reply comment deadline may be extended.

9. Obtaining copies

75. All spectrum-related documents referred to in this paper are available on ISED's Spectrum Management and Telecommunications website.

76. For further information concerning the process outlined in this consultation or related matters, contact:

Innovation, Science and Economic Development Canada
c/o Director, Space Services Planning
235 Queen Street
Ottawa, Ontario K1A 0H5
Telephone: (343) 291-1920

Email: ic.spectrumengineering-genieduspectre.ic@canada.ca

Annex A—List of fixed stations transmitting in the 18.8-19.3 GHz band

Licensee	Location	Coordinates
8640025 Canada Inc. (formerly Téliphone Navigata-Westel Communication)	Hasler, BC	55°34’26” N, 121°56’37” W
	Fred Nelson Creek, BC	55°39’13” N, 122°12’10” W
	Wabi Hill, BC	55°40’06” N, 121°34’59” W
Banff Springs Hotel	Banff, AB	51°10’15” N, 115°32’35” W
	Banff, AB	51°09’52” N, 115°33’46” W
Bell Canada	Big Tancook Island, NS	44°28’00” N, 064°09’56” W
	Freeport, NS	44°17’10” N, 066°19’05” W
Bell Mobility Inc.	Horseshoe Valley, ON	44°32’48” N, 079°40’54” W
	Markham, ON	43°51’08” N, 079°16’53” W
	Mattawa ON	46°18’25” N, 078°38’47” W
	Niagara Falls, ON	43°06’12” N, 079°04’16” W
	Notre-Dame-du-Bon-Conseil, QC (Chemin Quatre Saisons)	45°59’07° N, 72°23’25° W
Whitecap Resources Inc.	Goodwater, SK	49°26’00” N, 103°42’07” W
City of Surrey	Surrey, BC	49°09’37” N, 122°47’09” W
Greater Vancouver Regional District	Burnaby, BC	49°15’35” N, 122°55’08” W
Highland Valley Copper Corporation	Bethlehem Lookout, BC	50°29’58” N, 120°59’49” W
	Highland Valley, BC	50°29’36” N, 121°02’39” W
Rogers Communications Canada Inc.	Antigonish, NS	45°37’08” N, 061°59’38” W
	Ballantrae, ON	44°02’56” N, 079°17’49” W
	Bridgewater, NS	44°23’10” N, 064°32’43” W
	Grand Bay, NB	45°18’58” N, 066°12’49” W
	Nauwigewauk, NB	45°28’08” N, 065°50’48” W
	Red Deer, AB	52°20’05” N, 113°51’06” W
	Rothesay, NB	45°22’02” N, 065°57’09” W
	Thunder Bay, ON	48°27’55” N, 089°13’38” W
	Thunder Bay, ON	48°26’12” N, 089°13’48” W
	Toronto, ON	43°49’09” N, 079°18’10” W
	Vaughan, ON	43°50’51” N, 079°32’54” W
	Yarmouth, NS	43°52’16” N, 066°03’58” W
TELUS Communications Inc.	Creston, BC	49°05’01” N, 116°29’05” W
	Langley, BC	49°00’11.9” N, 122°31’52.4” W
	Port Coquitlam, BC	49°15’03” N, 122°44’45” W
Westcoast Energy Inc.	Charlie Hill, BC	56°16’44” N, 121°02’42” W
	Prince George, BC	53°54’12” N, 122°42’10” W

Annex B—List of earth stations operating in the 18.8-19.3 GHz band

Licensee	Location
Hughes Network Systems	London, ON
Hughes Network Systems	White City, SK
Inmarsat Solutions (Canada)	Winnipeg, MB
Telesat Canada	Allan Park, ON
Telesat Canada	Fort McMurray, AB
Telesat Canada	Saskatoon, SK
Telesat Canada	St. John's, NL
Wildblue Communications Corp	Winnipeg, MB
Xplornet Communications Inc.	Regina, SK
Xplornet Communications Inc.	Sherwood Park, AB

Annex C—List of satellites authorized in the 17.3-17.7 GHz band

Licensee	Satellite	Orbital position	Uplink frequencies (GHz)	Downlink frequencies (GHz)
Ciel	Ciel-2	129 W	17.3-17.8	12.2-12.7
Telesat Spectrum General Partnership	Nimiq 5	72.2/75.5 W	17.3-17.8	12.2-12.7
Telesat Spectrum General Partnership	Nimiq 6	91 W	17.3-17.8	12.2-12.7
Telesat Spectrum General Partnership	Nimiq 4	82 W	17.3-17.8	12.2-12.7
Ciel	Ciel-5	86.5W	24.75-25.25	17.3-17.8
Ciel	Ciel-6	103 W	24.75-25.25	17.3-17.8

Annex D—List of earth stations in the bands 17.3-17.7 GHz, 19.3-19.7 GHz and 29.1-29.25 GHz

Licensee	Location	Frequency band (GHz)
Telesat Canada	Allan Park, ON	17.3-17.7
Telesat Canada	Calgary, AB	17.3-17.7
SED Systems	Saskatoon, SK	17.3-17.7
Bell ExpressVu	Toronto, ON	17.3-17.7
Bell ExpressVu	Longueuil, QC	17.3-17.7
Hughes Network	Vancouver, BC	17.3-17.7
Inmarsat	Winnipeg, MB	19.3-19.7 / 29.1-29.5
Iridium	Yellowknife, NT	19.3-19.7 / 29.1-29.5
Iridium	Iqaluit, NU	19.3-19.7 / 29.1-29.5
Telesat Canada	Allan Park, ON	29.1-29.5