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Spectrum Management and Telecommunications

# **Decision on Updates to the Licensing and Fee Framework for Earth Stations and Space Stations in Canada**

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## **1. Intent**

1. Through the release of this document, Innovation, Science and Economic Development Canada (ISED), on behalf of the Minister of Innovation, Science and Industry (the Minister) announces decisions (the Decision) resulting from the consultation process undertaken in Canada Gazette Notice SMSE-009-21, *Consultation on Updates to the Licensing and Fee Framework for Earth Stations and Space Stations in Canada* (the Consultation). The Consultation addressed the licensing and fee regime for all space stations and all earth stations, except for those earth stations specifically exempt under the *Radiocommunication Act*. Existing fees were reviewed for spectrum licences in the fixed-satellite service (FSS), the broadcasting-satellite service (BSS) and the mobile-satellite service (MSS).

2. Comments and/or reply comments on the Consultation were received from:

- BCE Inc. (Bell)
- Canada Centre for Mapping and Earth Observation (CCMEO)
- Canadian Communication Systems Alliance Inc. (CCSA)
- Canadian Space Agency (CSA)
- Environment and Climate Change Canada (ECCC)
- Global VSAT Forum (GVF)
- Inmarsat Solutions (Canada) Inc. (Inmarsat)
- Iridium Satellite Canada Ltd. (Iridium)
- Kepler Communications Inc. (Kepler)
- Ligado Networks (Canada) Inc. (Ligado)
- OneWeb (1021823 B.C. Ltd.)
- Radio Amateurs of Canada (RAC)
- Rogers Communications Canada Inc. (Rogers)
- SES S.A. (SES)
- Shaw Communications Inc. (Shaw)
- Space Exploration Technologies Corp. (SpaceX)
- SSi Micro Ltd. (SSi)
- Telesat Canada (Telesat)
- TELUS Communications Inc. (TELUS)
- TerreStar Solutions Inc. (TerreStar)
- Viasat Inc. (Viasat)
- Xplornet Communications Inc. (Xplornet)

## **2. Mandate**

3. The Minister, 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 use and ensuring effective management of the radio frequency spectrum resource.

### **3. Legislation**

4. The Minister 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*, which are set out in the *Radiocommunication Regulations*.

### **4. Policy objectives**

5. The radio frequency spectrum is a unique and scarce resource that is an integral component of Canada's telecommunications infrastructure. ISED encourages the efficient and optimal use of spectrum through policy and standards to ensure its continued availability. The type of licence and the associated licence fees are one mechanism designed to both promote the effective use of spectrum and to earn a fair return for the Canadian public for the privilege of access to this public resource.

6. In developing the Decision, the Minister was guided by the policy objectives of the Spectrum Policy Framework for Canada (SPFC) to maximize the economic and social benefit that Canadians derive from the use of the radio frequency spectrum in light of the challenges of a rapidly changing technological environment. ISED is committed to ensuring that Canada has a world-class telecommunications infrastructure, and that Canadian consumers, businesses and public institutions continue to benefit from advanced wireless telecommunications services and applications.

7. Canada faces unique geographic challenges, with 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 many of those communities, with terrestrial solutions not feasible in the near term.

8. In May 2019, the Government of Canada released Canada's Digital Charter: Trust in a digital world (the Digital Charter). The Digital Charter lists universal access as the first of 10 principles that will lay the foundation for a made-in-Canada digital approach and guide policy thinking and actions towards establishing an innovative, people-centred and inclusive digital and data economy built on trust. The principle of universal access states that all Canadians will have an equal opportunity to participate in the digital world and will have the necessary tools to do so, including access, connectivity, literacy and skills. Satellite systems will play a key role in supporting universal access in the most remote areas of the country.

9. The Government of Canada is also committed to promoting the delivery of broadband services to rural and remote areas across the country. In 2019,

High-Speed Access for All: Canada's Connectivity Strategy was launched, and a national connectivity target was announced that aims to make speeds of at least 50 megabits per second (Mbps) download and 10 Mbps upload available to all Canadian homes and businesses. As part of this commitment, ISED is considering the need to support and encourage connectivity for rural and remote communities as it develops new licensing rules and a fee regime for satellite services.

10. The Decision supports the objectives of the SPFC, the Digital Charter and Canada's Connectivity Strategy by simplifying the licensing approach and fee structure, while reducing fees overall to support the evolution of the satellite industry and facilitate the deployment of innovative satellite solutions, including those for broadband connectivity.

## **5. Background and context**

11. With the exception of the rules and fees for FSS and BSS satellites, which were updated in 2014 and 2016 respectively, the licensing and fee framework for satellite services has not been updated in over three decades. This framework varies according to the type of satellite service, and it employs different types of licensing instruments (e.g. radio licences and spectrum licences).

12. The satellite industry has been undergoing a fundamental transformation in recent years, with new technologies, launch capabilities, industry players, and services. This transformation includes the deployment of high throughput satellites in geostationary satellite orbit (GSO), the development of large constellations in low Earth orbit (LEO) for the provision of broadband connectivity, the increased accessibility of space through the low-cost build and launch of SmallSats and CubeSats, and the introduction of new, disruptive industry players. Commercial activity in earth observation applications has continued to expand rapidly and new commercial communication services, such as the satellite-enabled Internet of Things, have emerged.

13. The Consultation proposed a number of changes to the licensing and fee framework for earth stations and space stations, with a view to supporting the deployment of modern satellite services and making those available throughout Canada, including in rural and remote areas.

## **6. Licensing framework**

14. The paragraphs below provide details about the decisions applicable to the licensing framework for space stations and earth stations.

### **6.1 Introduction of spectrum licensing for earth stations**

15. ISED sought views on replacing radio licences with spectrum licences for the authorization of Earth stations, including fixed earth stations, transportable earth stations and

earth stations in motion (ESIMs), and proposed two types of earth station spectrum licences: spectrum licences requiring site approval and generic spectrum licences. Under this licensing approach, multiple stations would be covered under a single licence, replacing the radio licensing approach where each station within a system is authorized individually. The spectrum licences would be issued annually, subject to the annual renewal cycle and annual licence fees.

16. ISED also proposed that the spectrum licences would be issued for the Tier 1 service area, which would authorize the radio service and the frequency bands, and identify the satellites (and associated International Telecommunication Union [ITU] filings) with which these stations are authorized to communicate. These licences would be subject to the general conditions of licence described in the Consultation, as well as frequency or location-specific conditions based on the spectrum policies of the band of operation.

### **Summary of comments**

17. Comments and/or reply comments were received from BCE, CCMEQ, CSA, ECCC, GVF, Inmarsat, Kepler, RAC, SES, Shaw, SpaceX, SSI, Telesat, TerreStar, Viasat and Xplornet. Overall, respondents supported ISED's proposal to replace radio licensing with spectrum licensing for earth stations, with multiple stations authorized under a single licence. Bell, Rogers and TELUS raised concerns over the use of spectrum licences to authorize ESIMs in some bands, given that the mobile nature of ESIMs could increase the risk of potential interference. These concerns are addressed in section 6.3.1, which explains generic spectrum licensing.

18. Respondents were generally supportive of licences being issued for the Tier 1 service area, but CSA, GVF, Inmarsat, RAC, SES, Shaw, SpaceX and SSI argued that smaller tiers should also be considered with lower fees, and SES, Shaw and SSI noted lower fees could be important in rural and remote areas. SES, Shaw and SSI also cited recent policy changes to the 3800 MHz band, where earth stations will not be permitted to operate in the 3700-4000 MHz band after March 2025; this is why smaller tiers with lower fees would be warranted. SES noted that aeronautical or maritime ESIM operators should be given an option of licensing distinct "offshore" or "at altitude" tiers for their operations.

19. While respondents were generally supportive of the conditions of licence proposed, they suggested that, rather than having the same conditions for both generic and site-specific licences, conditions be streamlined for generic licences. GVF and SES, in particular, felt that some conditions were unnecessary and that compliance requirements were too cumbersome in ISED's Standard Radio System Plan SRSP-101, *Technical Requirements for Fixed Earth Stations Operating Above 1 GHz in Space Radiocommunication Services and Earth Stations on board Vessels (ESVs) Operating in the Fixed-Satellite Service*, and in its Client Procedures Circular CPC-2-0-03, *Radiocommunication and Broadcasting Antenna Systems*. The RAC noted that many of the general conditions are not applicable or are applicable only with

modifications. Telesat sought clarification from ISED on whether an exemption for antenna systems that are less than 15 metres above ground level, as described in CPC-2-0-03, also applies to end-user equipment that is authorized under a generic licence held by a carrier.

20. SpaceX recommended removing the “research and development” condition of licence and waiving the certification requirements for equipment that would be subject to generic licensing. Telesat proposed that ISED’s licences also include authority for the circulation and operation of ESIMs outside of Canada. This view was supported by GVF in reply comments, adding that foreign-licensed ESIMs should be permitted to operate in Canada without a licence. Viasat expressed concerns over the issuance of licences for ESIMs on a no-interference, no-protection basis and urged ISED to issue licences for GSO ESIMs with equivalent status and protection as GSO FSS services in the Ka-band, particularly in those bands allocated exclusively to satellite services.

## **Discussion**

21. Given the widespread support, ISED will implement spectrum licences to authorize all fixed and transportable earth stations and all ESIMs. Earth station spectrum licences will include the frequency range, the type of service(s), and the satellite(s) with which the earth station(s) can communicate. A single licence will authorize the operation of multiple earth stations.

22. ISED has considered the comments related to licensing for the Tier 1 service area and is of the view that issuing licences for smaller tier sizes is neither necessary nor appropriate for satellite services. In general, satellite footprints cover very large geographic areas, and most satellite operators and service providers currently hold licences in multiple tiers. A single Tier 1 licence authorizing multiple earth stations with one associated fee allows and encourages spectrum reuse and does not result in additional costs for an earth station licensee to expand its service area or to add earth stations to expand capacity.

23. ISED clarifies that the Tier 1 level should be understood as meaning Canada-wide, including Canadian air space and waters where the *Radiocommunication Act* applies.

24. In response to comments related to the streamlining of conditions of licence, ISED has categorized the conditions listed in annex A by licence type, noting that a number of general licence conditions apply to all licences. Additional conditions of licence will apply to certain types of licences, and these are addressed in sections 6.2 and 6.3. ISED will update the relevant CPCs and related licensing documents to reflect the results of the Decision.

25. ISED notes concerns expressed with the application of SRSP-101 and intends to update SRSP-101 through a separate technical consultation in future. ISED notes that while all earth stations are required to comply with the requirements set out in SRSP-101 throughout the licence term, the submission of information to assess compliance as part of a

licence application will be routinely required only for ESIMs and for fixed earth stations intended for self-installation by consumers.

26. With respect to comments on CPC-2-0-03, ISED notes that CPC-2-0-03 applies equally throughout the spectrum management program to any proponent who is planning to install or modify an antenna system, including earth station antennas.

27. In response to SpaceX's comment on removing the "research and development" condition of licence, ISED notes that this condition currently applies only to MSS earth stations, and ISED did not propose to expand the condition to other licences. ISED notes that there are currently no earth station or space station licences that meet the threshold for the condition to require research and development investment, as the condition is currently written. In response to SpaceX's other comments, ISED notes that there are currently no certification requirements in place for earth stations subject to generic licences.

28. With respect to comments related to the inclusion of the operation of ESIMs outside of Canada under a Canadian licence and the recognition of foreign-licensed ESIMs within Canada, ISED notes that it would not be possible to support such ESIM operations without an international framework or agreement in place. For example, the current roaming framework for MSS earth stations below 3 GHz is based on the Global Mobile Personal Communications by Satellite Memorandum of Understanding (GMPCS-MoU), which establishes non-legally binding terms of cooperation as the framework relates to type approval, licensing, and the marking of terminals. The framework also deals with customs arrangements and access to traffic data.

29. Similarly, there is a regulatory framework in place that allows for international recognition of certain radio equipment used in the provision of maritime and aeronautical services, and that is supported by global frequency allocations and standards established by international regulatory bodies such as the International Civil Aviation Authority (ICAO) and the International Maritime Organization (IMO). However, there is no global framework for FSS or ESIMs. ISED will monitor international developments in the area of the global circulation and operation of ESIMs, including ongoing discussions at the Inter-American Telecommunication Commission's (CITEL) Permanent Consultative Committee (PCC) II meetings, and will review its policies as appropriate.

## Decision

### D1

ISED will adopt a spectrum licence model to authorize fixed and transportable earth stations and ESIMs within the Canadian territory, with multiple earth stations authorized under a single licence.

Earth station spectrum licences will include the frequency range, the type of service(s), and the satellite(s) with which the earth station(s) can communicate.

ISED will issue the proposed spectrum licences for a Canada-wide service area, including Canadian air space and waters where the *Radiocommunication Act* applies.

ISED will apply the general conditions of licence that are listed in annex A to earth station spectrum licences. Additional specific conditions of licence based on the earth station type are addressed in sections 6.2 and 6.3.

## 6.2 Earth station spectrum licences requiring site approval

30. In the Consultation, ISED proposed two different types of earth station spectrum licences. The first type is a spectrum licence for which each individual earth station site requires approval from ISED before the earth station is deployed. ISED proposed a number of cases where such site approvals would be required.

31. For earth station spectrum licences requiring site approval, ISED proposed to collect the technical information as identified in annex B of the Consultation. ISED also proposed that earth stations operating in bands shared with the flexible use service hold licences for entire spectrum blocks, as per terrestrial SRSPs that define band plans. ISED sought comments on other types of earth stations that should be subject to site approvals, in addition to those proposed by ISED.

### Summary of comments

32. Comments were received from BCE, CCMEQ, CSA, ECCC, GVF, Inmarsat, Kepler, OneWeb, RAC, SES, Shaw, SpaceX, SSI, Telesat, TerreStar, Viasat and Xplornet. Overall, there was general support for the proposal to require site-specific approvals for certain earth stations, as proposed by ISED.

33. Several respondents, namely GVF, SES, Shaw and Xplornet, commented that ISED should have very clear definitions and explanations for the types of stations that would require site approvals. GVF, Telesat and SES also suggested that generic spectrum licences be used as much as possible, with licences requiring site approvals as the exception. The RAC commented that for operators in the amateur satellite service, site-specific spectrum licensing

should be applied only to stations that perform telemetry, telecommand and control (TT&C) functions.

34. ECCC noted that its data collection platforms and direct broadcast ground systems operating in the frequency ranges 401-403 MHz, 1670-1710 MHz, 7750-7900 MHz and 8025-8400 MHz are eligible for spectrum licensing requiring site approvals. ECCC reiterated that its earth stations are of vital importance to weather services. ECCC also indicated that sensor networks and environment-monitoring stations could be considered for generic licensing. This notion is addressed in section 6.3.1.

35. A common suggestion among GVF, SES, Telesat and Viasat was that transportable earth stations should not be licensed via site-approved spectrum licences since generic spectrum licences would be more practical. In that context, some respondents suggested that transportable stations could receive generic licences under certain conditions, for example, if power levels were below a certain threshold or if operations were limited to frequency bands allocated exclusively to FSS.

36. SSI indicated that its support for site approvals was based on the understanding that the process would be no more onerous than the existing process for radio licensing. CCMEQ favoured the streamlining of the application process. TerreStar expressed concerns regarding the process of converting existing authorizations to new spectrum licences and whether this conversion would require existing licensees to refile detailed information and undergo reassessment.

37. ISED's proposed list of technical requirements for site-approved earth stations was supported by BCE, ECCC, Kepler, SpaceX, TELUS and TerreStar. BCE noted the need for complete technical information about such sites to avoid and mitigate interference to and from them. ECCC similarly observed that such technical information is required to conduct electromagnetic compatibility analyses, and further noted that it is also required for international coordination, as outlined by ISED.

38. On the other hand, GVF, Inmarsat and SES expressed concerns with ISED's proposed list of technical information and urged certain changes to be made. GVF suggested that not all of the information is necessary to understand the interference potential or susceptibility of the earth stations, while Inmarsat and SES noted that some information seemed of limited relevance given the advent of adaptive coding and modulation.

39. OneWeb proposed that a minimum separation distance be established between gateways supporting different non-geostationary satellite orbit (NGSO) systems in order to facilitate coexistence.

40. The majority of respondents did not support a requirement for earth station licensees, in bands shared with flexible use systems with site-approved spectrum licences, to hold licences for entire spectrum blocks, as prescribed in relevant terrestrial SRSPs. BCE

supported the proposal but suggested that voluntary agreements should be reached among the licensees if the spectrum requirements are smaller than the blocks identified. Telesat suggested the requirement be applied on a case-by-case basis in certain bands, in light of specific proposals for such blocks. GVF, Inmarsat and SES argued that channelization plans differ between services, and operators should pay for only the maximum bandwidth that will be used. CSA, GVF, Inmarsat and SES also argued that such requirements would be inappropriate for TT&C and beaconing operations, given that only a small amount of spectrum is required for those operations and interference potential is also small.

41. ISED also sought views on whether additional technical information is required for authorizations that will be subject to site-approved licences and whether there are additional types of stations that should be subject to site-approved licences. Respondents all agreed that no additional information should be required for site-approved licences, and no suggestions were received.

## **Discussion**

42. ISED understands that licensees need clarity when planning and applying for earth station licences, and it recognizes that the categorization proposed in the Consultation may not have been sufficiently clear. ISED has considered the comments received, and it has clarified below which earth stations will require spectrum licences with site-approval earth stations. ISED further clarifies the types of earth stations that will be eligible for generic licensing in section 6.3.

43. Operators of the following types of earth stations will require spectrum licences with site approval, regardless of their band of operation:

- stations conducting TT&C functions for associated satellite networks and systems
- gateway and feeder link stations for FSS, BSS and MSS
- landing stations used to backhaul telecommunications services within a community hub model, where local distribution is done by terrestrial services
- customer user terminals (consumer or business) operating in bands not eligible for generic licensing
- any other earth stations operating in bands not eligible for generic licensing

44. ISED will not prescribe a minimum distance between earth stations as any such distance would depend on specific technical and operating characteristics and geographic or terrain conditions.

45. For the site-approval process, a single spectrum licence will be issued and each individual station under the spectrum licence will be approved by ISED. For each earth station, the licensee will be required to submit the technical information described in annex B for assessment and must receive approval by ISED before the deployment and operation of that station. An applicant will be able to apply for a single station or for multiple stations in

the initial application and will be required to apply for site approval each time additional stations are added to the spectrum licence. A licensee must seek ISED's approval before making any changes to the operating parameters of any site-approved station. Multiple stations will be part of a single spectrum licence, with the fee being assigned to the licence, not to each individual location or station.

46. ISED notes that comments were provided related to the required site information, as set out in annex B of the Consultation, and the Department is currently defining the required changes to the Spectrum Management System that will be implemented as a result of the Decision. Some of the requirements in annex B have been modified in light of comments received, and ISED has added data elements required for international coordination. ISED notes that the list of required technical information for earth stations requiring site approval will be finalized during the development of the relevant CPC.

47. ISED recognizes that SRSPs addressing terrestrial services are not necessarily relevant to earth station or satellite operations. Consequently, ISED will not require that earth stations operating in bands shared with the flexible use service hold licences for entire spectrum blocks, as per terrestrial SRSPs that define band plans. Earth station licensees will be authorized and will pay spectrum licence fees based on the operational requirements of the earth stations.

## Decision

### D2

ISED will require spectrum licences requiring site approval for the following earth stations, regardless of their band of operation:

- stations conducting TT&C functions for associated satellite networks and systems
- gateway and feeder link stations for FSS, BSS and MSS
- landing stations used to backhaul telecommunications services within a community hub model, where local distribution is done by terrestrial services
- customer user terminals (consumer or business) operating in bands not eligible for generic licensing
- any other earth stations operating in bands not eligible for generic licensing

ISED will require that the technical information set out in annex B be provided for site-approved earth stations operating under a spectrum licence before the stations become operational. ISED's approval must be sought every time the technical information for a station needs to be modified before the new modifications take effect. The final technical requirements will be defined in the relevant CPC.

ISED will not require that spectrum licences requiring site approvals align with spectrum blocks, as prescribed in terrestrial SRSPs.

### 6.3 Spectrum licences for generic earth stations

48. The second type of earth station licence proposed by ISED was a spectrum licence that would authorize “generic” earth stations. In the Consultation, ISED recognized that many earth stations are deployed in bands for which specific coordination is not required between earth stations or with terrestrial services, or in bands where there have been no issues with harmful interference between services. In these bands, earth stations may be ubiquitously deployed when their technical characteristics are identical or similar, such as for customer-premises antennas for home Internet or ESIMs providing broadband connectivity on board aircraft. ISED proposed spectrum licences for generic earth stations for these systems.

49. Since 2015, ISED has been authorizing these types of systems of identical earth stations in certain portions of the Ku- and Ka-bands on an interim basis, including issuing ESIM licences on a case-by-case and no-interference, no-protection basis. To date, there have been no interference issues reported on these authorizations, and ISED therefore proposed to formalize this interim approach and expand it to additional frequency bands. A number of bands were proposed in the Consultation and are addressed in section 6.3.1.

#### Summary of comments

50. Comments were received from BCE, GVF, Inmarsat, Kepler, Rogers, SES, Shaw, SpaceX, SSI, Telesat, TELUS, Viasat and Xplornet. There was strong support for ISED’s proposal. However, the majority of the stakeholders noted that the definition of “identical” earth stations was unclear and urged ISED to establish a definition that would be broad enough to allow multiple models of equipment to be authorized under a single licence. Some respondents (BCE, Rogers, TELUS and Shaw) also highlighted the need for ISED to monitor the deployment of these systems to ensure that there is no interference.

#### Discussion

51. ISED notes that under its existing interim approach for systems of identical earth stations, multiple models of earth station terminals are allowed to operate under a single authorization, as are communications with multiple satellites. Client Procedures Circular CPC-2-6-01, *Procedure for the Submission of Applications to License Fixed Earth Stations and to Approve the Use of Foreign Satellites in Canada*, refers to the concept of “typical earth stations”, which aligns with filing practices at the ITU.

52. ISED will consider earth stations to be “identical” if they:

- use the same frequencies
- have the same or lower maximum transmit power
- have the same maximum antenna gain
- operate within the same range of bandwidths and type of emissions
- communicate with the same associated satellite(s)

53. ISED has applied a similar approach to its existing ESIM authorizations. In addition to these elements, ISED will also consider antenna size and antenna radiation pattern in determining whether earth stations can be considered “identical”. The complete list of elements describing identical earth stations is included in annex C.

54. ISED has considered comments suggesting that transportable earth stations should be licensed via generic spectrum licences, given they are stations that can be moved from one location to another but operate only while at a fixed location. ISED sees merits to this approach, but it has some concerns related to managing potential interference from those with high-power operations. Choosing a suitable cut-off power level for transportable earth stations to address this concern could be challenging and arbitrary at this stage. As a way forward, ISED will permit the generic licensing of transportable earth stations but may require technical information before licensing on a case-by-case basis.

55. Given the broad support for ISED’s proposal, ISED will implement spectrum licences for generic earth stations with the clarifications provided above with respect to “identical” earth stations. The following types of earth stations will be eligible for generic spectrum licences:

- user terminals (consumer or business)
- ESIMs
- receive-only earth stations operating as part of an enterprise network that supports content and broadcasting distribution, and operating in accordance with SLPB-002-21, *Decision on the Technical and Policy Framework for the 3650-4200 MHz Band and Changes to the Frequency Allocation of the 3500-3650 MHz Band*
- transportable earth stations
- certain sensor networks in specific frequency bands, as defined in section 6.3.1

56. In some cases, specific earth station and/or location information may be required to facilitate coexistence in shared bands or with services in adjacent bands, as is currently the case for receive-only earth stations operating under interim authorizations in the 3700-4200 MHz band. In such cases, licensees will be required to use the site upload database that is currently used for the interim authorizations.

57. For generic licences requiring site upload, the list of required technical information will be finalized during the development of the relevant CPC. Client Procedures Circular CPC-2-1-23, *Licensing Procedure for Spectrum Licences for Terrestrial Services*, may also apply.

58. Given the status of ESIMs within the international regulatory framework, generic spectrum licences authorizing ESIMs will continue to be issued on a no-interference, no-protection basis. ISED will continue to monitor international developments and may undertake updates, as appropriate.

59. As with the current interim approach, if earth stations are considered “identical” (see criteria listed in annex C), ISED will authorize different models of earth stations operating in the same bands under a single licence. Further, ISED will issue, to a given licensee, a single generic earth station licence for multiple sets of identical stations.

60. Applications for generic spectrum licences must include the technical information listed in annex C, which may be further refined through the development of relevant CPCs. As always, licensees will be required to provide any technical and station location information that is requested by ISED at any time during the licence term.

61. ISED notes that all earth stations must comply with the requirements set out in SRSP-101 throughout the licence term. However, ISED retains the discretion to request technical information at any time. For ESIMs and fixed earth stations intended for self-installation by consumers, ISED will require the submission of information to assess compliance as part of a licence application.

62. Additional technical requirements for ESIMs may also be developed through a technical consultation in the future.

## Decision

### D3

ISED will implement spectrum licences for generic earth stations for the following types of earth stations (see annex C):

- user terminals (consumer or business)
- ESIMs
- receive-only earth stations operating as part of an enterprise network that supports content and broadcasting distribution, and operating in accordance with SLPB-002-21, *Decision on the Technical and Policy Framework for the 3650-4200 MHz Band and Changes to the Frequency Allocation of the 3500-3650 MHz Band*
- transportable earth stations
- certain sensor networks in specific frequency bands, as defined in section 6.3.1

ISED will authorize, under a single licence, different models of earth stations operating in the same bands if the stations are considered “identical”.

ISED will issue, to a given licensee, a single generic earth station licence for multiple sets of identical stations.

ISED will require the submission of information to assess compliance with SRSP-101 as part of a licence application for ESIMs and fixed earth stations intended for self-installation by consumers.

ISED will continue to license ESIMs on a no-interference, no-protection basis.

ISED may require technical information before licensing of transportables, on a case-by-case basis.

ISED will require all licensees holding spectrum licences for generic earth stations to provide technical and location information on their stations if requested at any time during the licence term.

### 6.3.1 Frequency bands where generic spectrum licences will be available

63. Through the Consultation, ISED sought comments on its proposal to allow generic spectrum licensing of identical fixed earth stations and ESIMs in a number of frequency bands.

### Summary of comments

64. Respondents generally supported ISED’s proposals for allowing generic licensing in the following bands:

- 4000-4200 MHz (space-to-Earth) and 5925-6425 MHz (Earth-to-space)

- 11.7-12.2 GHz (space-to-Earth) and 14.0-14.5 GHz (Earth-to-space)
- 13.75-14.0 GHz (Earth-to-space)
- 18.3-18.8 GHz (space-to-Earth) and 18.8-19.3 GHz (space-to-Earth)
- 19.7-20.2 GHz (space-to-Earth) and 29.5-30 GHz (Earth-to-space)
- 28.35-28.6 GHz (Earth-to-space)
- 28.6-29.1 GHz (Earth-to-space)
- 29.25-29.5 GHz (Earth-to-space)

65. However, some concerns were expressed with the rest of ISED's proposals. For fixed earth stations in the 3700-4200 MHz (space-to-Earth) band, SES recommended a simple voluntary registration mechanism to ensure its continued protection from flexible use transmitters in that band; SES urged ISED to continue allowing licence-exempt operations by eligible operators that are part of an enterprise network. BCE opposed the generic licensing of such earth stations in the 3700-4000 MHz portion of the band, suggesting that ISED restrict any FSS use in the band in non-satellite dependent areas after March 2025, consistent with the 3800 MHz Decision; BCE noted that generic licensing would complicate the deployment of flexible use systems. In its reply comment, Rogers supported BCE's position.

66. Rogers also expressed a number of concerns with the proposed types of ESIMs in the 5925-6425 MHz (Earth-to-space) band, the 10.7-10.95 GHz and 11.2-11.45 GHz (space-to-Earth) bands, and the 10.95-11.2 GHz and 11.45-11.7 GHz (space-to-Earth) bands. In its reply comment, Rogers argued that allowing ESIMs on a no-interference, no-protection basis would result in an unreasonable delay in resolving interference experienced by primary services. Rogers further highlighted spectrum policies in the 10.95-11.2 GHz and 11.45-11.7 GHz bands, where a moratorium on fixed services in portions of these bands may be lifted in 2026, allowing for increased fixed service deployment. Rogers argued that allowing land ESIMs would constrain future fixed deployments.

67. BCE expressed some concern with the 12.2-12.7 GHz (space-to-Earth) band, noting that the band is extensively used for direct-to-home television services in Canada, and the protection of such services is important for broadcasters that provide TV service across the country. BCE also noted that the Federal Communications Commission (FCC) has recently sought comments on allowing mobile services in this band and thus urged ISED to postpone a decision until the future of this band becomes clear in the United States.

68. In response to ISED's question on whether to also allow communication with NGSO satellites in the space-to-Earth direction in the 17.7-18.3 GHz band, BCE and GVF indicated their support; however, Rogers expressed concerns related to the ongoing discussions at the ITU Radiocommunication Sector (ITU-R) on developing technical rules for compliance with pfd limits by aeronautical ESIMs. Given the complex nature of NGSO systems, Rogers noted that ISED should wait until after the World Radiocommunication Conference (WRC-23) decisions on agenda item 1.16.

69. For the proposal to allow the generic licensing of aeronautical and maritime ESIMs communicating with GSO satellites in the 27.5-28.35 GHz band (Earth-to-space), BCE, Kepler, Rogers and TELUS expressed concerns. Kepler suggested that the implementation of ISED's proposal should be delayed until studies have been carried out on the viability of ESIMs in this band. Rogers opposed the proposal for the same reasons identified in comments related to the 17.7-18.3 GHz band. TELUS also opposed the proposal due to concerns about interference from maritime ESIMs in coastal areas and from aeronautical ESIMs operating at low altitudes, recommending that ISED maintain its case-by-case approach to ESIM licensing. While BCE initially supported ISED's proposal, it expressed similar concerns to those of TELUS in its reply comments. Noting the priority of terrestrial services over FSS through footnote C74, Bell recommended that ISED adopt appropriate measures to protect terrestrial deployments before allowing the generic licensing of ESIMs in the band.

### **Discussion**

70. Noting the general support for ISED's proposals to allow generic licensing in the bands listed in paragraph 63, ISED will proceed as proposed. For ease of reference, the list of all bands eligible for generic earth station licensing is included as annex D.

71. For the 4000-4200 MHz (space-to-Earth) band, ISED notes the concerns but maintains that the generic licensing of identical receive-only earth stations that are part of an enterprise network is consistent with spectrum policy decisions made in the 3800 MHz Decision. ISED will therefore replace existing current interim authorizations with generic spectrum licences with site data information, while new earth stations will be limited to the 4000-4200 MHz portion of the band, as per the 3800 MHz Decision.

72. For the 5625-6425 MHz (Earth-to-space) band, the 10.7-10.85 GHz and 11.2-11.45 GHz (space-to-Earth) bands, and the 10.95-11.2 GHz and 11.45-11.7 GHz (space-to-Earth) bands, ISED notes that FSS operations are already permitted in Canada, subject to technical rules to protect terrestrial systems, and that ESIMs would be receiving in most of these bands. In the 5625-6425 MHz band, where ESIMs would be transmitting, only maritime and aeronautical ESIMs were proposed, as these stations will have less potential to cause interference to terrestrial fixed systems due to geographical or altitudinal separation. As with all generic-licensed ESIMs, these stations will operate on a no-interference basis and any ESIM causing harmful interference in this band would be required to cease operation until the issue is resolved. ISED notes that in the 10.95-11.2 GHz and 11.45-11.7 GHz bands, there are already ubiquitously deployed FSS earth stations for direct-to-home television services with no interference issues. Given the above considerations and support from other respondents for ISED's proposals, ISED will implement generic licensing for these bands, as proposed.

73. In the 12.2-12.7 GHz (space-to-Earth) band, ISED notes that FSS earth stations receive in this band and that satellite transmissions are subject to *Radio Regulations* provisions to protect the broadcasting service. ISED will therefore implement generic licensing in this band. ISED is also monitoring the FCC proceeding on the viability of

introducing mobile service in this band but notes that the band has not been identified as a priority for a mobile service allocation in Canada.

74. In the 27.5-28.35 GHz (Earth-to-space) band, concerns with ISED's proposal mainly centred around the potential for harmful interference from aeronautical and maritime ESIMs to flexible use systems expected to deploy in the same band. As stated in the *Decision on Releasing Millimetre Wave Spectrum to Support 5G* (the mmWave Decision), ISED is of the view that these stations will have less potential to cause interference to flexible use systems than land ESIMs due to geographical or altitudinal separation. All generic earth stations are required to meet applicable technical requirements from SRSP-101, as amended from time to time. With these considerations in mind, ISED will allow the generic licensing of aeronautical and maritime ESIMs communicating with GSO satellite systems, as was proposed. ISED will not allow the generic licensing of aeronautical and maritime ESIMs communicating with NGSO systems at this time, and will monitor related international developments.

75. ISED notes that future changes to spectrum allocation or utilization policies may have implications for which bands are eligible for generic earth station licensing. Any such changes would follow band-specific public consultations.

## Decision

### D4

ISED will allow generic spectrum licensing systems of identical fixed earth stations and ESIMs in certain bands as discussed above and listed in annex D.

76. In addition to the bands proposed in the Consultation, ISED also sought comments on any other bands that should be considered for generic spectrum licensing for fixed earth stations and ESIMs.

## Summary of comments

77. ECCC suggested that certain bands allocated for meteorological satellite (METSAT) service and for Earth exploration-satellite service (EESS) could potentially be included, noting the Consultation's indication that generic licensing could extend to sensor networks and environment-monitoring stations. Out of all the bands suggested, the 401-403 MHz band is of particular interest to ECCC, given its use by hundreds of fixed earth stations across Canada to uplink environmental data from its remote weather, water and climate monitoring stations. ECCC also noted that its provincial and territorial partners have similar uses for this band as well.

78. SES encouraged ISED to consider the 12.7-12.75 GHz and 12.75-13.25 GHz bands for the generic licensing of aeronautical and maritime ESIMs communicating with either GSO

or NGSO systems on a no-interference, no-protection basis. It noted that there appears to be a small number of licences in the fixed service within these bands and that interference into such systems would be limited. SES suggested not waiting for the outcome of WRC-23 agenda item 1.15 based on the fact that the principles of operation for those two types of ESIMs are well understood and are the same as in other parts of the Ku-band, where such ESIMs are allowed.

79. Viasat urged ISED to consider the 19.3-19.7 GHz (space-to-Earth) band and the 29.1-29.25 GHz (Earth-to-space) band for the generic licensing of fixed and GSO ESIMs. Noting the discussion on the applicability and implementation of ITU *Radio Regulations* footnote 5.517A and ITU-R Resolution 169 (WRC-19), Viasat suggested that a station's access to generic licensing could be conditional on the GSO FSS operators being required to protect MSS feeder link gateway stations.

80. Finally, Telesat suggested allowing the generic licensing of fixed earth stations, transportable earth stations and ESIMs in the 40-42 GHz (space-to-Earth) band and the 48.2-50.2 GHz (Earth-to-space) band, noting that this kind of licensing would provide clarity to planned and authorized space stations in these bands. Inmarsat suggested allowing the generic licensing of fixed earth stations and ESIMs in these same bands, given that in the ITU *Radio Regulations* these bands are identified for high-density applications in the fixed-satellite service (HDFSS).

## **Discussion**

81. ISED agrees that certain earth stations, such as those operated by ECCC in the 401-403 MHz band, would be appropriate for generic licensing. Although the band is shared between EESS, MSS, meteorological aids and space operation services on a co-primary basis, historically there have been very few instances of harmful interference between the services. ECCC's earth stations in this band transmit data in short duration and at power levels significantly lower than those of gateway earth stations. Given these considerations, ISED will allow the generic licensing of fixed earth stations that are part of an environment-monitoring sensor network in this band. However, given the importance of these stations to weather forecasting and environmental monitoring, ISED will require licensees in the band to upload site information into the licensing database; a similar requirement is imposed on receive-only stations operating in the 3700-4200 MHz band.

82. ISED notes that the 12.7-12.75 GHz and 12.75-13.25 GHz bands are "planned bands" set aside to facilitate equitable access by ITU member states to GSO FSS orbital spectrum. Given the importance of these bands for equitable access and the fact that studies are still ongoing under WRC-23 agenda item 1.15, ISED will not allow generic earth station licensing in these bands at this time. ISED will monitor international developments and amend its spectrum policies as appropriate.

83. Within the 19.3-19.7 GHz and 29.1-29.25 GHz bands, Canadian footnote C16D gives priority to fixed service over FSS in the use of these bands. Further, Canadian footnotes C46A and C48 limit the use of these bands by FSS to feeder links for MSS and low-density deployments of earth stations communicating with GSO satellite systems. Given that ubiquitously deployed earth stations are not permitted in these bands, these bands will not be eligible for generic licensing.

84. For the 40-42 GHz and 48.2-50.2 GHz bands, ISED is still in the early stages of assessing coexistence and determining appropriate technical rules. The sharing between the different services in these bands is also being studied and discussed within the ITU-R; therefore, it is premature to consider the generic licensing of earth stations in these bands.

### **Decision**

#### **D5**

ISED will permit the generic licensing of fixed earth stations in the meteorological satellite service in the 401-403 MHz band as discussed above and listed in annex D.

ISED will require licensees in the 401-403 MHz band to provide certain station-specific information.

### **6.3.2 Additional conditions for ESIMs and earth stations installed by consumers**

85. ISED also proposed to authorize ESIMs on a no-interference, no-protection basis and to require licensees to provide a contact that would be available 24 hours a day, 7 days a week. It proposed that applicants for ESIMs and other fixed stations sold directly to consumers must demonstrate compliance with SRSP-101 as part of the licence application process. ISED also sought views on whether a radio standards specification (RSS) should be developed for stations intended for direct installation by consumers.

### **Summary of comments**

86. BCE, CSA, GVF, Inmarsat, SES, SpaceX, SSi, Telesat and TELUS all agreed that ESIMs should be licensed on a no-interference, no-protection basis and that a contact should be provided that is available 24 hours a day, 7 days a week. The RAC noted that generic spectrum licences would not be appropriate for these stations.

87. On the proposed requirement to demonstrate compliance with SRSP-101, comments were received from BCE, CSA, Inmarsat, Kepler, SES, SpaceX, SSi, Telesat, TELUS and Xplornet. While most respondents were supportive, Kepler and SpaceX argued that such a requirement is excessive. SES opposed the proposal, adding that the SRSP requires updating to better apply to ESIMs and systems of identical earth stations. SES also noted that current requirements primarily address GSO satellites and are unnecessarily burdensome. Other

general comments included TELUS suggesting that ESIMs should continue to be licensed on a case-by-case basis, given the potential for interference to primary services, and Xplornet suggesting that earth stations authorized with generic licences should be exempt from the requirements stated in CPC-2-0-03.

88. Finally, in response to ISED's question regarding whether an RSS should be developed for earth stations sold directly to and installed by consumers, comments were received from BCE, GVF, Inmarsat, RAC, SES, SpaceX, Telesat and Viasat. Nearly all of the respondents supported the idea of developing an RSS, noting that the current standards were primarily developed for earth stations intended for professional installation. The respondents also urged that, where possible, ISED should align with international standards. The RAC noted that since the equipment used in amateur stations is not subject to a certification requirement, such an RSS would not be applicable to earth stations in the amateur service or the amateur satellite service. SpaceX argued that an RSS was not necessary and that ISED should facilitate competition between operators to promote user-friendly and safe installations, without regulatory intervention that could unintentionally impede development and have no coinciding benefit. While SSI had no views concerning whether ISED should develop an RSS, SSI noted that any such RSS must be carefully drafted so that it has no anti-competitive effects that might restrict the development of competitive satellite systems, including non-Canadian LEO systems for Canadians.

## **Discussion**

89. As stated in D3, ISED will license ESIMs on a no-interference, no-protection basis. Licensees will be required to provide a contact that will be available to ISED 24 hours a day, 7 days a week. In response to requests for clarification, ISED will accept a generic contact associated with an operations centre, as long as that contact is monitoring operations and can respond at all times.

90. ISED again notes that all earth stations must comply with the requirements set out in SRSP-101 throughout the licence term. While ISED retains the discretion to request technical information at any time, it will require the submission of information to assess compliance as part of licence applications for ESIMs and for fixed earth stations intended for self-installation by consumers.

91. ISED notes the support of stakeholders for the development of an RSS for earth stations sold to and installed by consumers. ISED agrees that a standard may be necessary in the future, but it is of the view that the direct-to-consumer market is not sufficiently advanced to warrant the development of a specific RSS at this time. ISED will monitor developments in this area and will reassess the need as appropriate. Should ISED proceed with the development of such an RSS in the future, it would be subject to a future technical consultation.

92. Although a dedicated RSS is not being proposed at this time, ISED notes that, as discussed earlier in the Decision, such stations are nonetheless subject to the conditions of licence outlined in annex A, which includes the technical requirements specified in ISED's SRSP-101. In addition, equipment must meet the requirements of Health Canada's Safety Code 6 to ensure that radio stations are installed and operated in a manner that complies with the limits of human exposure to radio frequency fields established by Health Canada.

### **Decision**

#### **D6**

ISED will require ESIM licensees to provide a contact that will be available to respond to interference issues 24 hours a day, 7 days a week. The contact may be a general contact associated with an operations centre, as long as that contact is monitoring operations and can respond at all times.

ISED will require applicants to submit technical information needed to confirm compliance with SRSP-101 when they apply for generic spectrum licences for ESIMs and for fixed earth stations intended for self-installation by consumers. Licensees will be required to continue to comply with the requirements set out in SRSP-101 throughout the licence term.

ISED will not develop an RSS at this time. ISED will monitor developments in this area and will reassess the need as appropriate.

## **6.4 Introduction of spectrum licensing for space stations for all satellite services**

93. The paragraphs below provide details about the decisions applicable to space stations operating in all satellite services.

### **6.4.1 Non-communications satellites**

94. ISED proposed to expand the spectrum licensing regime to all non-communications satellites currently operating under radio licences. Under this proposal, space station spectrum licences would be issued immediately upon a favourable licensing decision, with the fee applicable only once the satellite(s) become(s) operational. The licence would authorize the radio service, the frequency band, the orbital location supported by an ITU filing, and a coverage area. ISED also proposed to establish the term of licence on a case-by-case basis and to apply the general conditions of licence as currently published on ISED's website as "N2 – Space station licences".

### **Summary of comments and discussion**

95. Comments were received from CSA, ECCC, GVF, Ligado, RAC, SES and TerreStar. All respondents supported ISED's proposals. The RAC specified that spectrum licences for amateur satellites should be subject to a flat fee, as was proposed for the developmental

service. The RAC's comments on space station licensing for amateur satellite services are addressed more specifically in section 7.5. Given the concurrence of respondents on its proposals, ISED will introduce spectrum licensing for space stations for all satellite services.

## Decision

### D7

ISED will introduce spectrum licensing for space stations in all satellite services, with licences authorizing the radio service, the frequency band(s), the orbital location and a coverage area.

ISED will set the licence term on a case-by-case basis for satellites that are not FSS, BSS or MSS.

ISED will apply the existing conditions of licence for space stations to the new spectrum licences. (The existing conditions are published as "N2 – Space station licences" on the Spectrum Management and Telecommunications website.)

## 6.4.2 FSS feeder link spectrum used by space stations in the MSS

96. ISED sought comments on its proposal to implement spectrum licensing to authorize FSS spectrum used by space stations for MSS feeder links and/or TT&C. Licences would be issued immediately upon a favourable licensing decision, with fees becoming payable only once the satellites are launched and in operation. ISED also sought views on whether to require MSS satellite operators to comply with the rules on minimum holdings, as defined in Radio Systems Policy RP-008, *Policy Framework for Fixed-Satellite Service (FSS) and Broadcasting-Satellite Service (BSS)*, for FSS feeder link spectrum supporting MSS.

### Summary of comments

97. On the proposal to issue spectrum licences for MSS feeder link and/or TT&C spectrum, there was support from GVF, Inmarsat, Kepler, SES and TerreStar, with the understanding that multiple earth stations would be covered under a single earth station licence. SpaceX noted that ISED should streamline its licensing regime and avoid requiring duplicative licence applications and fees.

98. In response to the question of whether FSS feeder link spectrum licences should be subject to the minimum holding requirement specified in RP-008, support was received from GVF and TerreStar. Kepler disagreed with the proposal on the basis that such requirements would deter potential newcomers to the Canadian satellite market who require only small blocks of spectrum. Inmarsat indicated that in the case of their TT&C and feeder link licences in the 3600-4200 MHz band, it would be inappropriate to apply a minimum spectrum holding requirement retroactively. SES was in favour of aligning the rules on FSS spectrum use for MSS feeder links and for FSS operators, but it questioned whether the RP-008 requirement to

hold licences for entire sub-bands was required. SES also expressed the view that this policy could result in licensees paying for spectrum that is not on a satellite. SES requested that ISED drop this requirement for both FSS and MSS satellite operators.

### **Discussion**

99. As there was general support for the introduction of spectrum licences for FSS spectrum used by space stations for MSS feeder links and TT&C, ISED will implement its proposal. Comments related to fees are addressed in section 7.

100. With respect to the requirement to hold entire sub-bands, as defined in RP-008, and the idea of extending it to FSS spectrum used for MSS feeder links, ISED notes that this requirement applies only to Canadian-licensed FSS and BSS satellites; if the requirement were extended, it would apply only to FSS feeder link spectrum for Canadian-licensed MSS satellites. The requirement does not apply to foreign-licensed satellites seeking or obtaining market access in Canada or to earth stations.

101. MSS satellites, when fully operational in their service band (e.g. L-band or S-band) require a significant amount of FSS feeder link spectrum. In reviewing existing licences for Canadian MSS satellites, it is evident that a requirement to hold full sub-bands as defined in RP-008 would not result in licensees holding spectrum in excess of their operational needs to support full loading and provision of services. As a result, ISED will extend the application of the requirement to hold sub-bands to FSS feeder link spectrum for new Canadian-licensed MSS satellites.

102. However, licensees of existing MSS space stations with operational satellites who do not currently meet this requirement will not be required to increase their licensed spectrum to reflect entire sub-bands.

103. To the extent that TT&C for MSS satellites may fall outside of a licensee's authorized feeder link spectrum, ISED will not apply the requirement to hold full sub-bands to those satellites, and will authorize only the spectrum needed to conduct TT&C operations.

## Decision

### D8

ISED will issue space station spectrum licences to authorize FSS feeder link and/or TT&C spectrum used by satellites to support MSS, with licences issued immediately after a favourable licensing decision and fees becoming payable only once the satellites are launched and in operation.

ISED will require spectrum licences for new MSS space stations to comply with the rules on minimum holdings as defined in RP-008 for FSS feeder link spectrum. ISED will not impose this requirement on existing MSS licensees already authorized and operational at the time of the publication of the Decision.

### 6.4.3 Changes to spectrum licences for MSS space stations

104. For the licensing of MSS satellites in service bands allocated to MSS, ISED proposed minor changes to licensing policies and procedures to align the rules for all space stations. First, ISED proposed to issue a spectrum licence, rather than an approval in principle, immediately upon a favourable licensing decision. The fee would be payable once the satellite(s) become(s) operational.

105. ISED further proposed to issue space station licences for 20-year terms and to issue separate spectrum licences for MSS space stations and associated earth stations, as is done for other satellite services. User terminals for both the satellite operator and any service providers would be authorized with generic spectrum licences, while earth stations that are performing TT&C, gateway and/or feeder link functions would be subject to a separate spectrum licence requiring site approvals.

### Summary of comments

106. Responses were received from GVF, Inmarsat, Kepler, SES and TerreStar. The majority of these respondents supported ISED's proposals. Although Kepler supported the issuance of spectrum licences in lieu of approvals in principle, it expressed concerns on the issuance of separate licences for MSS space stations and earth stations. Kepler suggested that ISED maintain the existing practice, which is that MSS spectrum licences include the authority to operate both space stations and earth stations on a single licence, because licensing them separately would add administrative burden and cost with no clear benefit.

### Discussion

107. As stated in the Consultation, one of ISED's main objectives is to replace the existing set of policies, procedures and fees, which are defined according to the type of satellite service and which employ different licensing instruments. The traditional definitions of satellite services (FSS, BSS, MSS, etc.) that form the basis of the licensing framework have

become blurred. ISED aims for a satellite licensing regime that is both technology- and service-neutral. Given the general support for its regime, ISED will implement its proposal to require separate space station and earth station licences for MSS to align with the approach used in other satellite services.

## **Decision**

### **D9**

ISED will issue spectrum licences instead of approvals in principle for MSS satellites, with licences issued immediately once an application has been accepted and with fees payable only once satellites are launched and operational.

ISED will issue spectrum licences for MSS satellites with a 20-year term.

ISED will issue separate spectrum licences for MSS satellites and earth stations, with each licence assigned a fee.

## **6.5 Types of licences required**

108. Within the current licensing regime for the majority of satellite services, separate earth station and space station licences are issued. In the Consultation, ISED proposed to retain the existing model and extend it to MSS, as described in section 6.4.3 above. Further, with the proposed changes to earth station licensing outlined in section 6.1, ISED proposed to issue three types of spectrum licences associated with a satellite network, with each assigned a separate fee: spectrum licences for earth stations requiring site approval, spectrum licences for generic earth stations, and spectrum licences for space stations.

109. ISED also proposed to allow communication with multiple GSO satellites on a single earth station spectrum licence but to require separate licences for earth stations communicating with NGSO systems, given the unique technical and orbital characteristics of each system.

### **Summary of comments**

110. Responses were received from BCE, CSA, ECCC, GVF, Inmarsat, Kepler, RAC, SES, SpaceX, SSi, Telesat, TerreStar, Viasat and Xplornet. Most respondents supported the proposal based on the fact that the proposed practice is in line with international best practices and will improve the licensing process. SSi added that the proposal would facilitate the operations of telecommunications service providers and others. GVF suggested that ISED also consider establishing an expedited process for adding GSO networks to an earth station spectrum licence.

111. SES stated that earth station spectrum licences should be able to include authority to communicate with both GSO and NGSO networks. The RAC specified that for operators in

the amateur satellite service, ISED should require licences only for spectrum that is needed for TT&C functions, and that such earth station licences should allow communication with multiple NGSO systems. Kepler disagreed with the proposal to require multiple licences on the basis that it would be onerous for satellite operators to obtain multiple licences, indicating that ISED should consider a single licence for a space system that would include both space and earth stations associated with a given satellite network or system. Telesat sought clarification with respect to what each licence would authorize and how the fees would be applied.

112. In the reply comments, SSi urged ISED to reconsider its proposal to issue separate licences and fees for earth stations communicating with GSO and NGSO satellites; it recommended the issuance of earth station spectrum licences with no distinctions between GSO and NGSO systems, allowing communication with multiple GSO networks and multiple NGSO systems on a single licence.

### **Discussion**

113. Based on general support, ISED will implement its proposal to issue up to three separate licences, as required. ISED will issue earth station licences that authorize communication with multiple GSO satellites under a single licence.

114. For clarification, Telesat's understanding of ISED's proposals was correct. ISED intends to issue a single spectrum licence to earth stations requiring site approval that would authorize the licence holder to own and operate site-approved earth stations throughout Canada that communicate with multiple GSO satellites in the authorized band, and that licence would have a single consumption-based fee. Of note, however, is that ISED's approval of each individual site would identify the GSO satellite(s) with which that particular station or site is authorized to communicate. Further, a single spectrum licence for an earth station requiring site approval would authorize the licence holder to own and operate site-approved earth stations throughout Canada that communicate with a single NGSO constellation in the authorized frequency bands, and that licence would have a single consumption-based fee.

115. ISED has considered comments related to allowing communication with multiple NGSO systems on a single earth station licence. ISED is of the view that for site-approved earth stations related to the operation of an NGSO constellation, separate licences will facilitate application assessment and coexistence with other services and networks, and will simplify compliance and enforcement efforts. As NGSO systems continue to deploy and evolve, ISED may revisit this policy through public consultation.

116. In response to comments received, ISED has reconsidered its proposal related to spectrum licences for generic earth stations communicating with NGSO constellations operated by a single licensee. ISED will allow a given licensee to communicate with multiple NGSO constellations on a single licence, as long the licensee meets licensing requirements

and the earth stations are “identical” (see annex C). Applications will be assessed and approved to ensure they meet all technical requirements related to each constellation. ISED is of the view that this process will provide service providers with greater flexibility to take full advantage of the range of satellite systems available in order to best serve market demand, as requested by SSI.

117. Although earth stations communicating with GSO and NGSO systems will not often share similar or typical parameters, ISED recognizes that it is technically feasible. As such, ISED may also allow the issuance a single spectrum licence for generic earth stations communicating with both GSO and NGSO satellites, on a case-by-case basis.

## **Decision**

### **D10**

ISED will issue the three types of satellite-related spectrum licences separately and assign a separate fee to each.

ISED will allow communication with multiple GSO satellites on a single site-approved earth station spectrum licence.

ISED will allow communication with multiple NGSO satellites on a single generic earth station spectrum licence.

ISED may allow communications with GSO and NGSO systems on a single generic earth station licence on a case-by-case basis.

## **7. Fee regime**

118. The paragraphs below provide details about the decisions applicable to the fee regime.

### **7.1 General principles**

119. ISED proposed to adopt a fee model based on how much spectrum is authorized, known as a “consumption-based model” (\$/MHz). This model is already in place for FSS, BSS and MSS satellite spectrum licences and for MSS earth station licences. The model was also recently implemented for fixed point-to-point radio licences. The consumption-based model is calculated based on the amount of spectrum authorized (consumed) multiplied by a base rate set in \$/MHz. ISED proposed to implement a consumption-based fee model for all new spectrum licences proposed in the Consultation. The requirements of the *Service Fees Act* must also be respected, including the implementation of a periodic fee adjustment that will apply to all fees.

## **7.2 Spectrum licence fees for earth stations**

120. The paragraphs below provide details about the decisions applicable to fees for earth stations.

### **7.2.1 Earth stations requiring site approvals**

121. ISED sought comments on its proposal to assign a consumption-based fee (\$/MHz) to earth station spectrum licences, where site and station approvals are required, with the adoption of different rates based on the frequency band, reflecting relative utility and value. Specifically, ISED proposed:

- for frequencies at or below 1 GHz: \$2000/MHz
- for frequencies above 1 GHz and at or below 3.4 GHz: \$100/MHz
- for frequencies above 3.4 GHz and at or below 7.075 GHz: \$20/MHz
- for frequencies above 7.075 and at or below 17.3 GHz: \$10/MHz
- for frequencies above 17.3 GHz and at or below 51.4 GHz: \$5/MHz
- for frequencies above 51.4 GHz: \$1/MHz

### **Summary of comments**

122. Comments were received from BCE, CCMEQ, CSA, ECCC, GVF, Inmarsat, OneWeb, RAC, SES, Shaw, SpaceX, SSI, Telesat, TerreStar, Viasat and Xplornet. Overall, there was general support to move to a consumption-based fee regime. Several stakeholders, including GVF, Inmarsat, SES and Viasat suggested that ISED align its fees with those of international peers by lowering the proposed rates. CCMEQ, SSI and Xplornet were concerned that the proposed changes would result in a significant increase in fees and sought exceptions for specific services (e.g. space operations) or for deployment incentives (e.g. for rural broadband). Xplornet specifically suggested lowering the proposed rates by 50%.

123. BCE and SSI were concerned with the proposed rates for C-band, with BCE suggesting that the C-band fees should be within the \$10-15/MHz range. Viasat proposed that ISED remove or reduce fees in the 27.5-28.35 GHz band due to the significant constraints placed on earth station deployments. OneWeb proposed that the same fee rate be applied to Ku- and Ka-band spectrum due to the similar nature of services provided in those bands. GVF and SES noted that FSS operators should be afforded the same flexibility as MSS operators, and that fees be charged based on the maximum amount of spectrum a system is capable of using within a range of possible operation. The RAC suggested that a flat fee be applied to license the earth stations performing control functions in the amateur satellite service. SpaceX opposed a consumption-based fee regime but proposed different band definitions and fee rates if the consumption-based approach were to be retained by ISED.

124. In the reply comments, BCE asked for fee reductions of 50% for site-approved earth stations that operate in the C-band. SSI supported SpaceX's proposed model and rates and

rejected BCE's proposed rate of \$10-15/MHz for C-band. SES also supported Xplornet's proposal to reduce fees by 50% and Viasat's proposal to remove or reduce fees for the 27.5-28.35 GHz band.

## **Discussion**

125. As described in the Consultation, ISED established C-band (3.4-7.075 GHz) as the reference band to establish the spectrum licence fee for earth stations, setting a rate of \$20/MHz, which aligns with the average annual fee (per MHz) currently paid by C-band licensees. The 3800 MHz Decision does not change the relevance of C-band as a reference band for earth stations requiring site approval.

126. ISED notes that comments favouring lower fee rates were not supported by financial or economic analysis. ISED further notes that the proposed fees represent an overall reduction in revenue from earth station licence fees of approximately 40%. ISED will implement fees for earth stations requiring site approval, as proposed.

## **Decision**

### **D11**

ISED will assign a consumption-based fee to earth station spectrum licences, where site approval is required, as follows:

- below or equal to 1 GHz: \$2000/MHz
- above 1 GHz and below or equal to 3.4 GHz: \$100/MHz
- above 3.4 GHz and below or equal to 7.075 GHz: \$20/MHz
- above 7.075 GHz and below or equal to 17.3 GHz: \$10/MHz
- above 17.3 GHz and below or equal to 51.4 GHz: \$5/MHz
- above 51.4 GHz: \$1/MHz

### **7.2.2 Generic earth stations for fixed earth stations and ESIMs**

127. ISED sought comments on its proposal to assign a consumption-based fee at a rate of \$5/MHz to generic earth station spectrum licences for fixed earth stations and ESIMs. This rate reflects the fact that most of the current and future deployments of this nature will be in the higher frequency ranges; the rate is therefore aligned with the fee for site-approved licences for the same bands. The rate also reflects the value of FSS spectrum used, regardless of whether the earth station operates in motion or only while fixed.

## **Summary of comments**

128. Comments on the proposal were received from BCE, CSA, ECCC, GVF, Inmarsat, OneWeb, SES, Shaw, SpaceX, SSI, Telesat and Xplornet. Views were varied on the proposed rates and on the application of a consumption-based approach; some respondents supported

the proposal, while others argued against it. Xplornet stated the proposal would increase challenges in providing affordable broadband to rural and remote areas in Canada. SSi specifically noted the discrepancy between the C-band rates proposed for licensees requiring site approval compared with those that qualify for generic licences.

129. GVF and SES asked for lower rates overall and the establishment of further reduced rates for licences issued on a no-interference, no-protection basis. SpaceX opposed the proposal overall and encouraged ISED to maintain a “no fee” for identical fixed earth stations and ESIMs. If fees were to be adopted, SpaceX recommended that ISED assign a rate of \$1/MHz to licensees operating in spectrum at 10.7 GHz and above. Inmarsat supported the model but recommended lowering the fee to align with international peers. OneWeb did not support the consumption-based approach but proposed a rate of \$1/MHz if the approach were adopted.

130. In the reply comments, Xplornet reiterated that there should be no fees for earth stations serving rural and broadband customers; however, if a fee were introduced, Xplornet indicated they would support SpaceX’s and OneWeb’s proposal to set the fees at \$1/MHz. SES recommended that licensees not requiring site approval not be charged more than those requiring site approval and supported the notion that a lower fee should be set for licences issued on a no-interference, no-protection basis.

## **Discussion**

131. ISED did not see any compelling arguments or supporting rationale for the alternate rates proposed by respondents. As stated in the Consultation, the interim approach for these systems was implemented because the use of radio licences, as established under the *Radiocommunication Regulations*, would have led to disproportionately high fees when compared with fees for similar licences. The interim approach was always intended to be temporary, until such time as the licensing framework was updated and an appropriate fee could be applied.

132. In establishing its proposals, ISED considered the financial impact of the new fees on existing licensees. With the exception of one current licensee, ISED notes that even with the introduction of a fee for generic earth station licences, the overall fees for broadband service providers decline significantly, owing both to the introduction of a consumption-based fee and the issuance of a single licence to cover multiple earth stations in the Tier 1 service area.

133. ISED will implement the fee for generic earth station licences, as proposed.

## **Decision**

### **D12**

ISED will assign a consumption-based fee at a rate of \$5/MHz to generic earth station spectrum licences for fixed earth stations, transportables and ESIMs.

### 7.3 Spectrum licence fees for MSS earth stations

134. The existing consumption-based fees for MSS spectrum licences were established in the late 1990s, as set out in DGRB-009-99, *Radio Authorization Fees for Mobile Satellite Services Using Radio Spectrum Above 1 GHz* and in DGRB-001-97, *Radio Authorization Fees for Mobile Satellite Services Using Radio Spectrum Below 1 GHz*. The fee ranges from \$540 per 100 kHz, for frequencies above 1 GHz, to \$1140 per 100 kHz, for frequencies below 1 GHz. The fee for above 1 GHz also includes a complex discount formula depending on whether the frequencies are shared with other service providers and/or satellite operators.

135. ISED proposed to simplify the spectrum licence fee for mobile earth stations and reduce it to \$1500/MHz for stations operating in bands allocated to MSS below 3 GHz, and to \$5/MHz for stations operating in bands allocated to MSS above 3 GHz. ISED also sought comments on its proposal to assign the spectrum licence fee to MSS earth stations based on the maximum amount of spectrum a system is capable of using, within a range of possible operation. This amount would be the assigned spectrum used in the fee calculation.

#### Summary of comments

136. Comments were received from GVF, Inmarsat, Iridium, Kepler, SES, SpaceX, TELUS and TerreStar. Most respondents supported the new structure and the proposed rate. SES supported the rates proposed but noted that the proposed fees were different from those proposed for FSS earth stations operating in the same bands; SES suggested that ISED consider whether that difference is justified. Inmarsat opposed the proposed rate, disagreeing with ISED's argument that there is contention for spectrum from terrestrial services and noting that L-band is exclusively allocated to MSS. Kepler disagreed with ISED's band valuation overall and suggested that ISED consider charging fees based on the service being offered. TELUS agreed with the proposed rates and also suggested that the proposed fee regime include an Ancillary Terrestrial Component (ATC) component. SpaceX stated that fees should be assigned on a cost-recovery basis. SpaceX also suggested alternate rates if ISED were to proceed with the consumption-based model.

137. In its reply comments, Kepler supported SpaceX's revised fee rates and frequency band breakdown and asked that ISED re-evaluate its proposals for spectrum below 3 GHz.

138. On the spectrum assignment proposal, comments were received from GVF, Kepler, Inmarsat, SES, SpaceX and TerreStar. Most respondents supported the proposal, with the exception of SpaceX, which advocated for a cost-recovery model. GVF and SES urged ISED to implement the same model as the one used for FSS systems.

#### Discussion

139. With respect to the proposed fee rates, ISED remains of the view that aligning the spectrum licence fee for bands allocated to MSS above 3 GHz with the proposed FSS/ESIM

rate for generic earth station licences appropriately reflects the convergence of FSS and MSS at higher frequencies, particularly for broadband services.

140. Below 3 GHz, however, the spectrum and equipment environment for MSS is quite different from FSS. Traditional MSS systems use omnidirectional antennas, they generally exist in a complex coordination environment that dictates the frequencies available for satellite operators and their service providers, and they require much smaller amounts of spectrum to provide services.

141. Inmarsat's argument that there is no contention from terrestrial services in the L-band is valid. However, as a counterpoint, ISED posits that an exclusive MSS allocation renders the spectrum more valuable to MSS providers and that this value is further enhanced through ISED's policy on ATC. ISED therefore remains of the view that \$1500/MHz is an appropriate rate for MSS spectrum below 3 GHz.

142. ISED's proposal to assign the spectrum licence fee to MSS earth stations based on the maximum amount of spectrum that can be used at once was made in the context of traditional MSS systems governed by broad international coordination agreements that place operational limits on traditional MSS satellites. These agreements then dictate the frequencies that satellite operators assign to various service providers, and those are the frequencies that need to be authorized under the licence of the earth station service provider.

143. As described above, with the consumption-based approach, the fees for all licences will be based on the amount of spectrum assigned in the licence. Given their operational environment and frequency segmentation, MSS licences will include authority to operate within an entire frequency range, but conditions of licence will be set and fees will be assigned based on spectrum that is secured through international coordination, allocated to service providers by the satellite operator, and available for use. ISED does not consider that a similar approach is required for FSS, where spectrum assignments are more stable and spectrum splitting is rare, given the use of highly directional antennas.

## **Decision**

### **D13**

ISED will modify the existing consumption-based fee for spectrum licences for MSS earth stations operating in the bands allocated to MSS, as follows:

- at or below 3 GHz: \$1500/MHz
- above 3 GHz: \$5/MHz

ISED will assign fees for spectrum licences for MSS earth stations based on spectrum that is secured through international coordination, allocated to service providers by the satellite operator, and available for use.

#### **7.4 Spectrum licence fees for space stations**

144. Recognizing the convergence of services and technologies, particularly between FSS and MSS at the satellite level, and the increasing commercialization of non-communications satellite services (e.g. EESS), ISED proposed to establish a single spectrum licence fee for the use of all frequencies allocated to satellite services and used by satellites, including those used by MSS. ISED further proposed to set the fee at the current FSS and BSS rate of \$124.84/MHz. For all services and frequency bands, the spectrum licence fee would become payable only once satellites are launched and operational.

#### **Summary of comments**

145. Comments were received from CSA, ECCC, GVF, Kepler, Ligado, SES, SpaceX and TerreStar. The majority of respondents supported the proposal. The CSA agreed with the proposal on the basis that the proposed fees would not increase for their satellites. SpaceX reiterated its position that ISED should charge fees based on cost recovery. Kepler supported the consumption-based model for all satellites but opposed the proposed rate for MSS satellites. Kepler noted that although the proposed rate of \$124.84 is an agreeable decrease from the current rate, it is not competitive with regulatory charges in other licensing administrations.

146. Ligado did not provide specific positions on proposals in this section of the Consultation but had commented earlier that the application of a fee at a rate of \$124.84/MHz for FSS spectrum used for feeder links for MSS would result in grossly disproportionate fees as compared with other administrations; Ligado proposed that if any fee is applied, it should be set at the value of the proposed earth station fee for the relevant frequency band. Ligado further suggested that fees should not be applied to satellites that are primarily used as on-orbit emergency backup assets. For such satellites, including its MSAT-2 mobile satellite, fees should become applicable only if the backup satellites resume operations.

#### **Discussion**

147. ISED is of the view that while examining approaches and licensing fees of other countries is useful, each administration is guided by their own policy objectives and overall approach to licensing spectrum, and fees are only one measure of regulatory costs.

148. With respect to comments related to applying the \$124.84/MHz fee to spectrum licences for FSS spectrum used for MSS feeder links and TT&C, ISED recognizes that this fee will result in a significant fee increase for Canadian-licensed MSS operators. It is important to note that under the existing radio licensing and fee regime, these operators have had access to significant amounts of spectrum at a very low cost due to the low levels of traffic on those systems. One of ISED's main policy objectives in licensing and assigning fees for the use of spectrum is to encourage efficient, effective and timely use of a scarce natural

resource. For space stations in particular, fees must reflect the fact that once spectrum has been assigned at a given orbital location, it typically cannot be licensed to another Canadian operator. While this practice is less applicable to NGSO systems, the basic principle of discouraging spectrum reservation and encouraging spectrum efficiency remains valid.

149. Given broad support for its proposal, ISED will implement its proposal for a single fee of \$124.84/MHz for all space station spectrum licences in all frequency bands. This spectrum licence fee will become payable only once satellites are launched.

### Decision

#### D14

ISED will assign a consumption-based fee of \$124.84/MHz to all space station spectrum licences in all services and frequency bands. The spectrum licence fee would become payable only once satellites are launched and operational.

### 7.4.1 Two-step fee for space station spectrum licences for NGSO systems

150. ISED's Consultation recognized that for large NGSO constellations, paying full fees from the launch of the first satellite may not necessarily reflect the way these systems are developed and deployed. In particular, companies may choose to deploy only a small number of satellites before the first deployment milestone to test the initial design and technology, and/or to conduct service demonstrations. Traditionally, and as is the current practice, a developmental licence could be issued for this phase. However, with large NGSO constellation development, some revenue may be generated from the first satellites as a means of funding the continued development and deployment of the constellation, making the company ineligible for a developmental licence. Even without an initial testing phase, for some constellations, the ability to provide a commercial service and generate significant revenue will require a critical mass of satellites to be launched and operational, which can take time depending on manufacturing and launch schedules.

151. To recognize the unique circumstances of NGSO constellations, ISED proposed the introduction of a two-step fee for space station spectrum licences for NGSO constellations in all satellite services. The fee for the first step was proposed at 50% of the current fee or \$62.42/MHz from the launch of the first satellite up until the deadline for the first deployment milestones, typically year 6. The second fee step was proposed to align with the current fee of \$124.84/MHz, to apply thereafter until the end of the licence term.

### Summary of comments

152. Comments were received from Kepler, SSi, SpaceX and Telesat that supported the idea of implementing the fee for NGSO systems in multiple steps. Telesat suggested that ISED adopt a three-step approach, where developmental licences and fees would apply to any

operational satellites that are non-revenue generating, followed by a fee of \$62.42/MHz from the start of revenue generation until the first deployment milestone, typically year 6. The final fee step of \$124.84/MHz would then apply until the end of licence term.

153. SSI did not object to the proposal but urged ISED to consider whether the proposal would inadvertently cross-subsidize a single Canadian-licensed NGSO system.

154. SpaceX repeated its general view that a cost-recovery model for fees should be implemented, and stated that a two-step approach for NGSO systems is reasonable. SpaceX recommended setting the second fee step at \$62.42/MHz and the first fee step at one-third of that amount, which would mark the milestone of one-third of the total satellites being in operation.

155. Kepler suggested a different approach, basing the fee on the number of satellites deployed. The second fee step would require the full payment once an operator has launched a pre-determined percentage of the constellation. In the event that ISED would not adopt a more prolonged approach, Kepler suggested that ISED consider the use of developmental licences but reassess the possibility of revenue generation from developmental licences.

## **Discussion**

156. ISED has taken note of alternate suggestions on how to assign an incremental fee for NGSO systems. As noted in the Consultation and in underlying policy documents such as the SPFC, ISED strives to set fees that are clear, predictable and simple for both ISED and licensees to administer. Consumption-based fees are consistent with fee principles within the broader spectrum program and reflect the value of spectrum assigned. It would be neither practical nor consistent with ISED's fee principles to establish a fee based on other factors, such as the number of satellites, level of service or revenue, or any other commercial factors. Further, introducing a fee based on non-spectrum factors would be complex, as each NGSO constellation and deployment strategy is unique. Further, experience over the past few years has demonstrated that NGSO constellation designs evolve over time. Trying to establish fees based on factors subject to change and unrelated to spectrum use would be unnecessarily complex and inconsistent with the overall spectrum management program.

157. ISED notes that developmental licences remain available for NGSO systems where licensees are in a testing or proof-of-concept phase but that these types of licences do not grant protection and may be limited in terms of coordinating with other NGSO systems or obtaining market access rights in other countries.

158. ISED recognizes that some adjustment to the proposed two-step approach is warranted. ISED will therefore modify the first fee step of \$62.42/MHz to be applicable from the launch of the first satellite up to the deadline for the final implementation milestone, the one marking the deployment of the full constellation, typically at year 9 for commercial communications systems. The second fee step of \$124.84/MHz would apply starting at year 9

and would continue until the end of the licence term, recognizing that all annual fees will increase over time based on CPI.

159. ISED notes that one of the advantages of the proposed two-step approach is that it is not linked to interim deployment milestones. As outlined in the existing licensing procedures of Client Procedures Circular CPC-2-6-02, *Licensing of Space Stations*, if the licensee does not deploy the full constellation by the final milestone but is providing commercial services, the licence will not be revoked. The licence will be amended to reflect the characteristics of the constellation at year 9. Similarly, the fee step of \$124.84 will be applied at the milestone date for full deployment that was established at licence issuance (typically year 9), regardless of the status of deployment.

160. ISED notes that different milestones may be applied to any given licence, for example for non-commercial (e.g. scientific) systems. In such cases, the second fee step would be aligned with the final milestone as set at the time of licensing.

## Decision

### D15

ISED will introduce a two-step fee for space station spectrum licences for constellations of NGSO satellites in any satellite service that is subject to phased deployment milestones:

- The first fee step of \$62.42/MHz will apply from the launch of the first satellite up until the deadline for the milestone, which marks the full deployment of the constellation, typically year 9.
- The second fee step, currently at \$124.84/MHz, will apply thereafter and will continue until the end of the licence term.

## 7.5 Minimum spectrum licence fees and developmental spectrum licences

161. ISED proposed to establish minimum spectrum licence fees for satellite-related licences, to be set at \$160/year for earth stations and \$300/year for space stations. The fee would apply in instances where a consumption-based approach would result in fees lower than the rates proposed above and applied on annual basis. ISED also proposed to assign the minimum fee of \$160/year to radio astronomy earth stations, regardless of the amount of spectrum authorized.

162. ISED also proposed to issue developmental earth station and space station spectrum licences and to establish a flat fee for such licences at the same rate as the proposed minimum fee, in the amount of \$160/year for earth stations and \$300/year for space stations. Developmental licences would not be available to authorize spectrum used for TT&C operations. ISED also sought comments on limits to eligibility requirements for

developmental spectrum licences, limits on frequency bands where developmental licences could be issued, and conditions of licence that could be applied.

### **Summary of comments**

163. On the establishment of minimum fees for spectrum licences for earth stations and space stations, comments were received from BCE, CSA, ECCC, GVF, Kepler, Inmarsat, SES, SpaceX, Telesat, TerreStar and Xplornet. The majority of respondents supported the proposal. SES also suggested that the minimum fee for earth stations should also be applied to spectrum licences for generic earth stations when subject to no-interference, no-protection basis. SpaceX again suggested for ISED to adopt a cost-based fee model for all licences.

164. On the proposal to assign a flat fee to radio astronomy earth stations, set at the same level as the minimum fee, comments were received from BCE, Inmarsat and SES. All respondents supported the proposal. While SpaceX did not comment on the specific proposal, it did note that ISED should ensure that the overall fee structure helps facilitate the important exploration conducted by radio astronomers.

165. In response to the question seeking views on limits to eligibility requirements for developmental spectrum licences and on limits on frequency bands where developmental licences could be issued, as well as on conditions of licence that could be applied, comments were received from BCE, CSA, ECCC, GVF, Kepler, Inmarsat, RAC, SES, SpaceX and Telesat, with broad support for the developmental licence fees from all respondents except Kepler.

166. BCE, ECCC, GVF, CSA and Inmarsat noted that developmental licences should be issued on a no-interference, no-protection basis. BCE noted that developmental licences should be restricted to bands that have an FSS or BSS allocation, with established co-existence rules for sharing with other services. Telesat advised that developmental licence fees should apply to any non-revenue generating operational NGSO satellite(s) until either the start of revenue generation or the first deployment milestone. While GVF, Inmarsat and SES supported the proposal on the basis that developmental licences are issued for non-commercial operations, Inmarsat also noted that no limits on eligibility requirements or frequency bands are needed. The RAC stated that developmental licences should not be issued for frequencies allocated to the amateur satellite service except for purposes directly related to the amateur service or the amateur satellite service, or in cases where frequency allocation is shared with other services for purposes directly related to the services to which the frequencies are allocated.

167. SpaceX stated that ISED should remain as flexible as possible in issuing developmental licences to support innovation while protecting incumbent and co-primary services. Kepler asked that ISED consider the use of developmental licences in the licensing of NGSO constellations and allow a certain amount of revenue generation, while prohibiting the generation of profits.

## Discussion

168. Minimum fees have been used in spectrum licensing as a proxy to reflect the value of a licence when the calculated value is below a reasonable threshold. In introducing spectrum licensing for all earth stations and remaining space stations currently under radio licence, ISED must establish a minimum fee. This fee would be applied whenever the use of the consumption-based model in the relevant frequency band would result in an annual fee lower than \$160. In light of general support expressed by respondents, ISED will implement its proposal to establish a minimum annual spectrum licence fee for earth stations at \$160/year and an annual spectrum licence fee for space stations at \$300/year. These fees will be applicable to each frequency band.

169. ISED will also establish a flat fee of \$160/year for radio astronomy earth station spectrum licences, regardless of the amount of spectrum authorized.

170. In response to stakeholder views on the eligibility requirements for developmental licences, ISED notes that the underlying principle for developmental licences is that the licence must have no revenue generation from its use and must be used instead for research and development, experimentation, or technology demonstration purposes.

171. ISED is of the view that this principle for developmental licences remains valid and that involving ISED in assessing the distinction between revenue and profit generation would be inconsistent with its licensing approach.

172. Developmental licences will be issued on a no-interference, no-protection basis and will be subject to a flat fee of \$160/year for earth stations and \$300/year for space stations.

173. Given the importance of avoiding harmful interference to TT&C functions, developmental licences will not be available for spectrum used for TT&C. ISED will issue standard earth station and space station spectrum licences for all TT&C frequencies, including those for amateur satellites and earth stations. Given the amount of spectrum used for TT&C, these licences would typically be subject to the relevant minimum fees.

## Decision

### **D16**

ISED will introduce a minimum annual spectrum licence fee of \$160/year for earth stations and \$300/year for space stations for each frequency band and will apply these fees whenever the application of the consumption-based fee model would result in a fee lower than these amounts.

ISED will apply an annual flat fee of \$160/year for earth station spectrum licences for radio astronomy sites, regardless of the amount of spectrum authorized.

**D17**

ISED will issue developmental licences on a no-interference, no-protection basis. Such licences must generate no revenue and be used for research and development, experimentation, or technology demonstration purposes.

ISED will introduce developmental spectrum licence fees for earth stations and space stations at a flat rate of \$160/year and \$300/year respectively.

**8. Other administrative aspects**

174. The paragraphs below provide details about other administrative aspects of the proposed licensing and fee regime.

**8.1 Prorated fees and short-duration licences**

175. In the Consultation, ISED proposed to define short-duration licences as licences that are issued during the year with terms of less than one year. ISED also proposed that the fee applicable to short-duration licences be set at 1/12th of the total annual fee for each calendar month until March 31.

176. For licences issued during the licence year that have terms of more than one year, ISED proposed that a prorated fee of 1/12th of the total annual fee would be assigned for each calendar month until March 31. Base rates and fees for all licences would be prorated and rounded to the nearest cent before being multiplied by the assigned spectrum. However, ISED proposed that, should the prorated fee be less than \$160 for an earth station spectrum licence or less than \$300 for a space station spectrum licence, the minimum annual spectrum licence fees would apply as per section 7.5.

**Summary of comments**

177. Comments were received from BCE, CSA, ECCC, GVF, Kepler, SES, SpaceX, TerreStar and Xplornet, and all supported the proposal.

**Discussion**

178. ISED's licensing year begins April 1 and concludes March 31. Annual licence and annual renewal fees are payable each year by March 31. Once paid, licences are valid until March 31 of the following year. Fees for spectrum licences with terms longer than one year are also payable annually on the same cycle. As with the current regime, ISED will continue to issue licences at any point during the year.

179. In the case of new and amended licences, the prorated fee would apply for each month, from the month the licence is issued until March 31st of the same fiscal year, after

which the licence would be subject to the annual fee. For the short-duration licences, which ISED proposed to define as licences that have terms of less than one year, the prorated fee of 1/12th of the total annual fee would apply for each month over the term of the licence. ISED will refer to short-duration licences as temporary licences, noting that a short-duration licence is intended to be temporary in nature and that its proposed definition aligns with the definition and application of temporary licences within the broader spectrum management program.

180. Base rates and fees for all new, amended and short-duration licences would be prorated and rounded to the nearest cent before being multiplied by the assigned spectrum. Should the prorated fee be less than \$160 for an earth station spectrum licence or less than \$300 for a space station spectrum licence, the minimum annual spectrum licence fees would apply as per section 7.5.

### Decision

#### D18

ISED will issue temporary spectrum licences for periods of less than one year.

ISED will assign a prorated fee of 1/12th of the total annual fee per month to new, amended, and temporary licences, with the lowest fee possible being \$160 for earth stations and \$300 for space stations for each frequency band.

### 8.2 Service standards and remissions

181. In accordance with the *Service Fees Act* and related policy directives, ISED sets service standards for all spectrum licence applications where a licence fee is applicable. ISED proposed to set the following service standards:

- Spectrum licences for earth stations requiring site approval: 126 days
- Spectrum licences for generic earth stations: 126 days
- Spectrum licences for space stations: 126 days
- Approval of additional sites under an existing spectrum licence for earth stations requiring site approval: 49 days

182. All applications related to satellite-related services would be subject to these proposed service standards and subject to remissions as per ISED's Service Fees Remission Policy and the Spectrum and Telecommunications Sector Program Annex.

### Summary of comments

183. Comments were received from BCE, CSA, ECCC, GVF, Kepler, SES, SpaceX, Telesat, TerreStar, Viasat and Xplornet. Overall, there was support for the proposed service standards. While Viasat and SES suggested that ISED should strive towards shorter time frames for all types of applications, CSA and GVF, in particular, noted that ISED should

streamline the process and shorten time frames for TT&C and gateway stations. SpaceX suggested that the service standard for the issuance of all earth station licences should be 49 days or less. Kepler suggested that a two-step process be implemented in application processing, with the first step being a preliminary analysis confirming whether an applicant has provided all of the required information. Kepler also indicated that ISED should establish a service standard for the issuance of developmental licences.

## **Discussion**

184. ISED is of the view that the proposed service standards for processing applications are appropriate given the complexity and the continuous evolution of satellite-related technology, as well as to ensure that the appropriate electromagnetic compatibility analysis and due diligence can take place. Service standards apply from the date that all required information is received until the date of licence issuance.

185. Following discussions on the changes required to ISED's licensing database in order to implement these decisions, the following clarification is provided for service standards related to the processing of spectrum licences for earth stations requiring site approvals. ISED will apply a 77-day service standard for the issuance of the spectrum licence. Once the spectrum licence is issued, a 49-day service standard will apply for the approval of individual sites. ISED will require the submission of at least one site for approval with the original spectrum licence application, bringing the total processing time to a maximum of 126 days. Additional sites added under the spectrum licence at a later date will also be subject to the 49-day service standard. If new frequencies are required for additional sites under the spectrum licence, these additions would be considered a modification of the spectrum licence, and the 77-day service standard for processing spectrum licences for earth stations requiring site approval would apply.

186. ISED will implement the service standards as proposed, noting the clarification above.

## **Decision**

### **D19**

ISED will establish the following service standards:

- Spectrum licences for earth stations requiring site approval: 77 days
- Site approvals of earth stations under a spectrum licence: 49 days
- Spectrum licences for generic earth stations: 126 days
- Spectrum licences for space stations: 126 days
- Approval of additional sites under an existing spectrum licence for earth stations requiring site approval: 49 days

## **9. Implementation**

187. Following the publication of the Decision, ISED will revise all associated radio systems policies (RPs), client procedures circulars (CPCs), fee orders, and other associated documentation. In addition, documents for all satellite-related licences will be managed in the Spectrum Management System, which will be modified to accommodate these licences.

188. As part of implementation, current licensees who are eligible for new spectrum licences will have an opportunity to confirm the accuracy of the parameters of their existing licences and authorizations so that the new spectrum licences will accurately reflect the associated earth and space stations.

189. ISED intends to have all necessary documentation and systems ready to issue new spectrum licences subject to the Decision and to have new associated fees take effect by April 1, 2023. Should ISED later determine that this time frame is not possible, licensees will be notified with sufficient time to plan fee payments for the 2023-2024 licensing year.

## **Annex A: Conditions of licence**

In addition to the typical conditions of licence listed below, any operational requirements specific to an earth station and/or to the authorized frequency bands will be stated as conditions of licence. Additional conditions may be developed on a case-by-case basis.

### **A1. General conditions of licence applicable to all earth stations:**

**Eligibility:** The licensee must comply with the eligibility criteria as set out in the [Radiocommunication Regulations](#).

**Licence transferability:** Licences may not be transferred or assigned without the prior authorization of the Minister. For clarification and without limiting the generality of the foregoing, “transfer” includes any leasing, sub-leasing or other disposition of the rights and obligations of the licence.

**Laws and regulations:** The licensee and its use of the spectrum assigned in this authorization are subject to and must comply with the International Telecommunication Union (ITU) [Radio Regulations](#), the Canadian [Radiocommunication Act](#), the Canadian [Radiocommunication Regulations](#), and Canada’s spectrum use policies pertaining to the licensed radio frequency bands, as amended from time to time.

**Technical acceptability:** The earth station radio apparatus must, under all operating conditions, comply with the applicable Canadian technical requirements as specified in Innovation, Science and Economic Development Canada’s (ISED) Standard Radio System Plan SRSP-101, [Technical Requirements for Fixed Earth Stations Operating Above 1 GHz in Space Radiocommunication Services and Earth Stations on board Vessels \(ESVs\) Operating in the Fixed-Satellite Service](#).

**Safety Code 6, land-use and public consultation, environmental assessment and aeronautical safety:** Licensees must comply with the procedures as outlined in Client Procedures Circular CPC-2-0-03, [Radiocommunication and Broadcasting Antenna Systems](#).

**Agreement with space station operator:** The licensee shall ensure that an agreement is in place with the space station operator or its representatives that provides for access to the space station capacity or signals.

**Reporting:** At any time, operators may be required, as directed by ISED, to demonstrate compliance with SRSP-101 and Safety Code 6 by providing detailed calculations and/or conducting site surveys, and by implementing corrective measures, where necessary.

**Licence fees:** Licence fees are paid on an annual basis, in advance, and are due by March 31 of each year.

## **A2. Additional conditions of licence for generic spectrum licences**

In addition to the general conditions of licence, the following conditions also apply:

**Operation of identical stations:** The licensee may install, operate or possess systems of identical earth stations, as defined by the authorization.

**Provision of technical information:** The licensee must provide technical and location information on a particular station or system of stations when requested by ISED, according to the definitions, criteria, frequency and timelines specified by the Department.

## **A3. Additional conditions of licence for earth stations in motion**

In addition to the general conditions of licence, the following conditions apply:

**Operation of identical stations:** The licensee may install, operate or possess systems of identical earth stations, as defined by the authorization.

**No-interference, no-protection:** Earth stations in motion (ESIMs) are authorized to operate on a no-interference, no-protection basis. Should the operation of an earth station cause interference, the licensee must immediately take steps to mitigate the interference, including, if necessary, ceasing the operations of their interfering earth station.

**Contact information:** The licensee shall provide ISED with a contact that is available 24 hours a day, 7 days a week, to be used in the event of harmful interference.

**Operation within Canada:** ESIMs are authorized for use within Canadian territory only, including Canadian air space and Canadian territorial waters.

## **A4. Additional conditions of licence for mobile-satellite services (MSS) earth stations below 3 GHz**

In addition to the general conditions of licence, the following conditions apply:

### **Lawful interception:**

- a. The licensee shall provide and maintain lawful interception capabilities, as set out in the Solicitor General's publication entitled *Enforcement Standards for Lawful Interception of Telecommunications*.
- b. The licensee may request that the Minister forbear from enforcing certain assistance capability requirements for a limited period. The Minister, following consultation with the Minister of Public Safety Canada, may exercise his power to forbear from enforcing a requirement or requirements where, in the opinion of the Minister, the

requirements are not reasonably achievable. Forbearance requests must include specific details and dates regarding timelines for compliance with requirements.

**Research and development:** The licensee must invest, as a minimum, 2% of its adjusted gross revenues resulting from the use of this licence, averaged over the term of the licence, in eligible research and development activities related to telecommunications. Eligible research and development activities are those that meet the definition of scientific research and experimental development adopted in the [Income Tax Act](#), as amended from time to time. Adjusted gross revenues are defined as total service revenues, less inter-carrier payments, bad debts, third-party commissions, and provincial goods and services taxes collected. The licensee is exempt from research and development expenditure requirements if it, together with all affiliated licensees that are subject to the research and development condition of licence, has less than \$1 billion in annual gross operating revenues from the provision of wireless services in Canada, averaged over the term of the licence. For this condition of licence, an affiliate is defined as a person who controls the carrier, or who is controlled by the carrier or by any person who controls the carrier, as per subsection 35(3) of the [Telecommunications Act](#).

**Technical requirements:** Radio equipment must meet all applicable Canadian radio equipment standards and, if required, be type-approved or certified for use in Canada.

**Roaming:** Roaming in other countries must respect the licensing regimes of those countries. To ensure compliance, the licensee must provide its subscribers with a copy of this condition of licence. Additionally, subscriber radio equipment brought into Canada by visitors for use while temporarily located in Canada must meet any applicable Canadian radio equipment standards and be certified for use in Canada **or** be type-approved by an administration that is a signatory to the Global Mobile Personal Communications by Satellite Memorandum of Understanding (GMPCS-MoU) and carry the GMPCS-MoU mark.

**Annual reports:** The licensee must submit an annual report for each year of operation, including:

- a statement indicating continued compliance with all licence conditions;
- an update on the provision of mobile satellite service, including the expansion of the services provided;
- an update on the satellites used for the provision of the service, the spectrum used and the number of subscriber earth stations operating within Canada;
- a statement indicating the annual gross operating revenues from the provision of wireless services in Canada and the annual adjusted gross revenues resulting from the use of this licence;
- when applicable, a report and description of research and development expenditures, signed by a duly authorized officer of the licensee as well as, on ISED's request, an

audited statement of research and development expenditures with an accompanying auditor's report; and,

- supporting financial statements signed by a duly authorized officer of the company if the licensee is claiming an exemption based on having less than \$1 billion in annual gross operating revenues.

All reports and statements must be submitted in electronic format by June 30 of each year to the Manager, Satellite Authorization Policy, Engineering, Planning and Standards Branch, at [satelliteauthorization-autorisationsatellite@ised-isde.gc.ca](mailto:satelliteauthorization-autorisationsatellite@ised-isde.gc.ca). Any confidential information provided will be treated in accordance with subsection 20(1) of the [Access to Information Act](#).

## **Annex B: Technical requirements for earth station spectrum licences that need site approval**

This annex contains a list of the technical information required in applications for earth station spectrum licences requiring site approvals. The final and definitive list of requirements will be defined through the development of relevant client procedures circulars (CPCs).

### **B1. Site information**

- Municipality and street address and/or site name
- Geographical latitude of the earth station in degrees, minutes and seconds up to an accuracy of 1/10 second
- Geographical longitude of the earth station in degrees, minutes and seconds up to an accuracy of 1/10 second
- Site elevation in metres above mean sea level
- For transportable earth stations, the radius of operation of the transportable station (in kilometres)

### **B2. Antenna information**

- Height (in metres) of the antenna centre above ground level
- Diameter of the antenna (in metres), accurate to two decimal places (e.g. 1.20)
- Isotropic gain of the transmit antenna (in dBi) in the direction of maximum radiation
- Transmit antenna half-power beamwidth (in degrees)
- Isotropic gain of the receive antenna (in dBi) in the direction of maximum radiation
- Receive antenna half-power beamwidth (in degrees)
- International Telecommunication Union (ITU) antenna reference pattern, or, if the pattern is not in the ITU antenna reference pattern list, an antenna measured radiation diagram (taking as a reference the direction of maximum radiation) for each band of operation
- Operating azimuthal angle or lower limit of the range (in degrees), clockwise from true north, in the direction of the satellite
- Operating elevation angle or lower limit of the angle (in degrees) of the antenna, from the horizontal plane, in the direction of the satellite
- If the earth station is communicating with an NGSO system, the upper limit for the range of operating azimuth angles (in degrees), clockwise from true north, in the direction of the satellite
- If the earth station is communicating with an NGSO system, the upper limit for the range of operating antenna elevation angles (in degrees), from the horizontal plane, in the direction of the satellite

**B3. Transmitter information**

- Transmit carrier frequency (in MHz) of the emission(s)
- Transmit occupied bandwidth
- For each carrier, the transmit class of emission using the ITU designators
- Type of polarization
- In the case of linear polarization, the angle of polarization
- Maximum peak envelope power (dBW) supplied to the input of the antenna
- Maximum power density in dB (W/Hz) supplied to the input of the antenna averaged over the worst 4 kHz band for carriers below 15 GHz, or averaged over the worst 1 MHz band for carriers above 15 GHz
- Minimum peak envelope power (dBW) supplied to the input of the antenna
- Minimum power density in dB (W/Hz) supplied to the input of the antenna averaged over the worst 4 kHz band for carriers below 15 GHz, or averaged over the worst 1 MHz band for carriers above 15 GHz
- Type and levels of modulation
- Modulated bit rate in megabits per second (data rate plus any bits added as a result of overhead, i.e. the addition of coding and error correction bits)

**B4. Receiver information**

- Receive carrier frequency or frequencies (in MHz) of the emission(s)
- Receive occupied bandwidth
- For each carrier, the class of emission using the ITU designators
- Type of polarization
- In the case of linear polarization, the angle of polarization
- Lowest total receiving system noise temperature (in degrees Kelvin) with reference to the output of the receiving antenna of the earth station under “clear sky conditions”, with this value being indicated for the nominal value of the angle of elevation when the associated transmitting station is aboard a geostationary satellite and, in other cases, for the minimum value of angle of elevation
- Type and levels of modulation
- Modulated bit rate in megabits per second (data rate plus any bits added as a result of overhead, i.e. the addition of coding and error correction bits)

**B5. Additional technical information required for international coordination (for transmit and receive stations)**

- Transmit class of station (see Telecommunications Regulation Circular TRC-43, *Designation of Emissions, Class of Station and Nature of Service*)
- Transmit nature of service (see TRC-43)
- Receive class of station (see TRC-43)
- Receive nature of service (see TRC-43)
- Carrier-to-noise ratio (C/N) in dB

## **Annex C: Technical requirements for spectrum licences for generic earth stations**

This annex contains a list of the technical information required in applications for spectrum licences for generic earth stations. The final and definitive list of requirements will be defined through the development of relevant client procedures circulars (CPCs).

Innovation, Science and Economic Development Canada (ISED) will consider earth stations to be “identical” if they:

- use the same frequencies
- have the same or lower maximum transmit power
- have the same maximum antenna gain
- operate within the same range of bandwidths and type of emissions
- communicate with the same associated satellite(s)
- same or smaller antenna size
- same antenna radiation pattern

### **C1. Technical requirements for spectrum licences for generic earth stations**

The following information must be submitted for each earth station model in applications for generic earth station licences:

- manufacturer and model name
- transmit frequency or frequencies
- maximum transmit power
- maximum antenna gain
- bandwidth and type of emission
- receive frequency or frequencies
- size of antenna
- antenna radiation pattern
- commercial name of the associated satellite(s)

For earth stations in motion (ESIMS) and earth stations intended for self-installation by consumers, ISED may require the submission of additional information in order to complete the evaluation of an application, such as demonstration of compliance with Standard Radio System Plan SRSP-101, *Technical Requirements for Fixed Earth Stations Operating Above 1 GHz in Space Radiocommunication Services and Earth Stations on board Vessels (ESVs) Operating in the Fixed-Satellite Service*.

**C2. Additional technical requirements for certain spectrum licences for generic earth stations**

In some cases, following licence issuance, ISED may require the submission of additional station information in order to facilitate coexistence in shared bands or with services in adjacent bands. The list of required technical information will be finalized during the development of the relevant CPC. For reference, these information elements are currently listed in Client Procedures Circular CPC-2-1-23, *Licensing Procedure for Spectrum Licences for Terrestrial Services*. Provisions of CPC-2-1-23 may also apply.

## **Annex D: List of bands eligible for generic licensing**

Generic licensing is permitted in the following bands as specified in table D1.

**Table D1: List of bands eligible for generic licensing**

| <b>Band</b>    | <b>Direction of transmission</b> | <b>Type of earth station</b>                                                                                                                                                                                              |
|----------------|----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 401-403 MHz    | Earth-to-space                   | Fixed earth stations that are part of an environment-monitoring sensor network operating under meteorological-satellite service or Earth exploration-satellite service                                                    |
| 3700-4200 MHz  | space-to-Earth                   | Fixed earth stations that are part of an enterprise network that supports content and broadcasting distribution and that were eligible to operate under an interim authorization in accordance with the 3800 MHz Decision |
| 4000-4200 MHz  | space-to-Earth                   | Aeronautical and maritime earth station in motion (ESIM)                                                                                                                                                                  |
| 5925-6425 MHz  | Earth-to-space                   | Aeronautical and maritime ESIM                                                                                                                                                                                            |
| 10.7-10.95 GHz | space-to-Earth                   | Fixed earth station (no-interference, no-protection basis in relation to other licensed services); aeronautical and maritime ESIM                                                                                         |
| 10.95-11.2 GHz | space-to-Earth                   | Fixed earth station; land, aeronautical and maritime ESIM                                                                                                                                                                 |
| 11.2-11.45 GHz | space-to-Earth                   | Fixed earth station; aeronautical and maritime ESIM                                                                                                                                                                       |
| 11.45-11.7 GHz | space-to-Earth                   | Fixed earth station; land, aeronautical and maritime ESIM                                                                                                                                                                 |
| 11.7-12.2 GHz  | space-to-Earth                   | Fixed earth station; land, aeronautical and maritime ESIM                                                                                                                                                                 |
| 12.2-12.7 GHz  | space-to-Earth                   | Fixed earth station; land, aeronautical and maritime ESIM                                                                                                                                                                 |
| 13.75-14.0 GHz | Earth-to-space                   | Fixed earth station; land, aeronautical and maritime ESIM                                                                                                                                                                 |
| 14.0-14.5 GHz  | Earth-to-space                   | Fixed earth station; land, aeronautical and maritime ESIM                                                                                                                                                                 |
| 17.7-18.3 GHz  | space-to-Earth                   | Aeronautical and maritime ESIM communicating with only GSO satellite system                                                                                                                                               |
| 18.3-18.8 GHz  | space-to-Earth                   | Fixed earth station; land, aeronautical and maritime ESIM                                                                                                                                                                 |

|                |                |                                                                             |
|----------------|----------------|-----------------------------------------------------------------------------|
| 18.8-19.3 GHz  | space-to-Earth | Fixed earth station; land, aeronautical and maritime ESIM                   |
| 19.7-20.2 GHz  | space-to-Earth | Fixed earth station; aeronautical and maritime ESIM                         |
| 27.5-28.35 GHz | Earth-to-space | Aeronautical and maritime ESIM communicating with only GSO satellite system |
| 28.35-28.6 GHz | Earth-to-space | Fixed earth station; aeronautical and maritime ESIM                         |
| 28.6-29.1 GHz  | Earth-to-space | Fixed earth station; aeronautical and maritime ESIM                         |
| 29.25-29.5 GHz | Earth-to-space | Fixed earth station; aeronautical and maritime ESIM                         |
| 29.5-30 GHz    | Earth-to-space | Fixed earth station; aeronautical and maritime ESIM                         |