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

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Spectrum Management and Telecommunications

Decision on Globalstar Canada's Application for Ancillary Terrestrial Component (ATC) Authority in the 2.4 GHz Band (2483.5-2500 MHz)

Aussi disponible en français – SMSE-009-20

Canada

Contents

1. Intent

1. Through the release of this document (the Decision), Innovation, Science and Economic Development Canada (ISED) on behalf of the Minister of Innovation, Science and Industry (the Minister), announces the decisions related to the *Notice of Application Received from Globalstar Canada Satellite Co. for Ancillary Terrestrial Component (ATC) Authority in the 2.4 GHz Band (2483.5-2500 MHz)* (the Notice).

2. All comments and reply comments received on the Notice are available on ISED's website. Comments and/or reply comments to the Notice were received from:
   - Cogeco Communications Inc. (Cogeco)
   - Globalstar Canada Satellite Co. (Globalstar Canada)
   - Kepler Communications Inc. (Kepler)
   - Redline Communications Inc. (Redline)
   - Rogers Communications Canada Inc. (Rogers)
   - Saskatchewan Telecommunications (SaskTel)
   - Shaw Communications Inc. (Shaw)
   - TerreStar Solutions Inc. (TerreStar)

2. Legislative 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 goals and national policies for spectrum utilization and for ensuring the effective management of the radio frequency spectrum resource.

3. Policy objectives

4. In developing this decision paper, ISED is guided by the policy objectives of the *Telecommunications Act* and the *Spectrum Policy Framework for Canada* (SPFC), which states that the objective of the spectrum program is to maximize the economic and social benefits that Canadians derive from the use of the radio frequency spectrum resource. This objective and the enabling guidelines listed in the SPFC remain relevant for guiding ISED in delivering its spectrum management mandate.

5. The enabling guidelines of the SPFC state that spectrum management practices, including licensing methods, should respond to changing technology and marketplace demands. In addition, these guidelines state that spectrum policy and management

should support the efficient functioning of markets by permitting the flexible use of spectrum to the extent possible, by making spectrum available for use in a timely fashion and by ensuring that appropriate interference protection measures are in place.

6. Mobile communications have become integrated into the daily lives of Canadians as they increasingly rely on mobile services to access a variety of mobile applications, such as multimedia services, social networking and Internet browsing, on a day-to-day basis to do business, connect with others, and manage finances, health and homes. A robust wireless telecommunications industry drives the adoption and use of digital technologies and enhances the productivity of the Canadian economy.

7. By ensuring that the spectrum being made available reflects global trends, emerging standards and the equipment ecosystem that is expected to materialize in the coming years, Canada will continue to position itself to benefit from advanced wireless technologies. Canadian consumers benefit from the economies of scale that come when manufacturers produce equipment for many markets, resulting in access to the latest devices at competitive prices for Canadians.

4. Background

8. ISED consulted via a Notice on August 8, 2019, seeking comments from stakeholders and the general public prior to making a decision regarding an application received from Globalstar Canada for authority to provide Ancillary Terrestrial Component (ATC) mobile services over 16.5 MHz of its licensed mobile-satellite services (MSS) spectrum in the 2.4 GHz band (2483.5-2500 MHz).

9. The 2004 Radio Systems Policy RP-023, *Spectrum and Licensing Policy to Permit Ancillary Terrestrial Mobile Services as Part of Mobile-Satellite Service Offerings*, established a set of spectrum and licensing policy principles to oversee the implementation of ATC as an integral part of the MSS offering. The principles provided guidance for the deployment of ATC mobile applications in conjunction with any MSS network operating in the "L-band" (1525-1559 MHz and 1626.5-1660.5 MHz), "2 GHz band" (2000-2020 MHz and 2180-2200 MHz) and "Big LEO bands" (1610-1626.5 MHz and 2483.5-2500 MHz). RP-023 was updated in 2014 to remove the 2 GHz band, reflecting the publication of SLPB-008-14, *Decision on a Policy, Technical and Licensing Framework for Mobile Satellite Service and Advanced Wireless Service (AWS-4) in the Bands 2000-2020 MHz and 2180-2200 MHz* (the 2 GHz Decision), as a separate document. The 2014 revision of RP-023 did not update the ATC policy for the remaining frequency bands.

10. In the Notice, ISED recognized that ATC applications have evolved significantly since the development of RP-023 in 2004. ATC was originally envisioned to support extension

of the primarily voice MSS to areas where MSS signals could not reach. ISED noted that technology, networks and applications have advanced considerably since then and that newer, more data-focused ATC applications have emerged. New applications include higher-speed voice and data, support of the Internet of Things (IoT), deployment of small cells in support of other mobile networks, and private Long-Term Evolution (LTE) networks. Many of these applications will support the deployment of innovative 5G services and provide an opportunity for improved services through additional capacity, while remaining compatible with the ongoing delivery of the primary MSS.

11. In its application, Globalstar Canada requested an authorization to provide ATC mobile services in the 2483.5-2500 MHz frequency range in accordance with RP-023. It also requested that ISED modify certain RP-023 requirements and adopt similar operational requirements and technical rules as identified by the U.S. Federal Communications Commission (FCC) in its 2016 Report and Order FCC 16-181, *Terrestrial Use of the 2473-2495 MHz Band for Low-Power Mobile Broadband Networks; Amendments to Rules for the Ancillary Terrestrial Component of Mobile Satellite Service Systems*. Adopting these rules and operational requirements would allow Globalstar Canada to provide low-power ancillary terrestrial mobile services using its licensed MSS spectrum.

5. Canadian ATC policy and Globalstar Canada's application

12. In the Notice, ISED noted that the rules in the 2004 ATC policy (RP-023) were developed based on the situation at the time, among them the status of ATC as an integral part of MSS and the expected use of dual-mode terminals. While some of the rules were removed for the 2 GHz band in 2014, they remained applicable to the 2.4 GHz band. Given the evolution of ATC since 2004, ISED proposed, through the Notice, to grant an authorization for Globalstar Canada's low-power ATC operations in the 2.4 GHz band with an updated set of rules.

13. ISED reiterated the importance of satellite communication in the Canadian telecommunications infrastructure and its contribution to communication and safety services in many dispersed and remote communities and areas in Canada. As part of its application, Globalstar Canada noted its development and continued operation of second-generation MSS satellites and attested that it would maintain its MSS in Canada.

Summary of comments

14. Globalstar Canada agreed with ISED's views on ATC having evolved significantly over the years, emphasizing that ATC applications can now be used to provide additional capacity to support the deployment of IoT, private small cell networks, private enterprise networks and 5G services.

15. Redline supported ISED's decision to consider Globalstar Canada's application before initiating a comprehensive review of RP-023, noting that the application addresses the significant spectrum demand for private LTE solutions in areas without cellular services. It also stated in its reply comments that the Notice provided sufficient opportunities for stakeholders to comment and there were no substantive arguments to delay the process.

16. Globalstar Canada, Redline and TerreStar supported removing the dual-mode requirement in order to take full advantage of increased flexibility and a greater equipment ecosystem. Globalstar Canada reiterated that no cost-effective dual-mode user equipment ecosystem has emerged and that the imposition of MSS delivery requirements would be sufficient to ensure the ongoing delivery of MSS in the absence of a dual-mode requirement.

17. Kepler stated that authorizing ATC for Globalstar Canada as proposed would contradict the current ATC policy, as ATC would become stand-alone and no longer be an "integral and indefeasible" component of associated MSS offerings. Kepler argued that consequently, the benefits of ATC described in the policy would no longer exist and considered such an authorization as equivalent to reallocating the 2.4 GHz band to the mobile service. Kepler believed that departing from the established ATC policy should be handled through public consultation proposing to amend RP-023.

18. Shaw opposed authorizing ATC in the 2.4 GHz band, arguing that it would make commercial mobile spectrum available without a proper public consultation and a competitive bidding process. Shaw added that this would create an inequitable windfall and allow Globalstar Canada to provide terrestrial services at a significant advantage over terrestrial wireless services providers. Shaw was also concerned about spectrum concentration, noting that Globalstar Canada could subordinate the spectrum to a major mobile carrier.

Discussion

19. As mentioned in the Notice, the request for a low-power ATC authorization from Globalstar Canada included operational conditions that differ from certain principles in RP-023, which was originally established based on technology and use cases envisioned in the early 2000s. The ATC landscape has changed significantly over the last 20 years.

20. Regarding comments on consulting on RP-023, since the development of other ATC frequency bands is still ongoing, ISED reiterates the appropriateness of considering the Globalstar Canada application in advance of a more comprehensive review of RP-023, given the limited changes requested and the opportunity for Globalstar Canada to provide additional services to Canadians.

21. RP-023 states that ATC systems are to be offered as an integral and indefeasible component of MSS offerings by means of using only dual-mode terminals. In 2014, ISED removed both these requirements for the 2 GHz band, given the lack of ecosystem for dual-mode terminals and the potential to increase the economic viability of the overall MSS and terrestrial business case, thus fostering the provision of mobile services in rural and remote areas. For similar reasons, removal of these requirements in the 2.4 GHz band would also be appropriate to address the continued lack of dual-mode equipment ecosystem and to provide Globalstar Canada with an opportunity to enhance the viability of its MSS and terrestrial use.

22. Given the continued importance of MSS, ISED believes that, as in the 2 GHz Decision, the authorization to deploy a stand-alone ATC system should still be tied to the provision of MSS in Canada. As mentioned in its application, Globalstar Canada has made significant investment renewing its MSS constellation, demonstrating its commitment to continue the provision of MSS. Advances in technology, such as the introduction of a Network Operating System (NOS), will facilitate deployment of a stand-alone ATC system without impacting MSS or other primary services in adjacent bands. (Note that in this document, the term "stand-alone" refers to ATC being independent of MSS in terms of service offerings. MSS would still be required to be maintained for stand-alone ATC.)

23. Maintaining the MSS requirement as a condition of licence would ensure that Globalstar Canada's authorization for stand-alone ATC would be tied to the provision of MSS. In addition, the licence would reflect the other principles for ATC authorizations detailed in RP-023.

24. With respect to comments that the 2.4 GHz band should be considered commercial mobile spectrum, ISED notes that the ATC system proposed by Globalstar Canada would operate at low power to support small cell applications, and would preclude the deployment of standard commercial mobile services. The low-power ATC use allows both MSS and terrestrial systems to thrive in the band in a complementary manner. Globalstar Canada is committed to continue providing MSS with its second generation satellite system, noting the ATC system is ancillary to MSS. ATC will provide Globalstar Canada an opportunity to make more efficient use of primary MSS spectrum, through the coordinated deployment of both satellite and terrestrial services.

Decisions

D1
ISED will grant an authorization to Globalstar Canada to operate only low-power ATC in the 2.4 GHz band, through a spectrum licence with a set of technical, policy and licence conditions as outlined in this Decision.

D2
The licensee must comply on an ongoing basis with all principles outlined in RP-023, including the requirement to maintain MSS, with the exception of the following:

- **ISED will remove the dual-mode user equipment requirement for Globalstar Canada in the 2.4 GHz band**
- **ISED will allow Globalstar Canada to deploy a stand-alone, low-power ATC system in the 2.4 GHz band subject to the conditions in this Decision.**

6. Policy and technical considerations

25. Globalstar Canada's ATC application detailed plans to deploy low-power time division duplex (TDD) LTE systems operating in "downlink duplex mode" (also referred to as "non-forward-band mode") in a small cell configuration in its MSS downlink spectrum (2483.5-2500 MHz). In the Notice, ISED proposed to allow this mode of operation and to adopt the same technical rules as in the U.S., including power limitations, the use of an NOS for controlling base stations, and unwanted emission limits to mitigate harmful interference concerns. Although Globalstar Canada's ATC application covered the 2483.5-2500 MHz band, ISED notes that in the U.S., Globalstar was authorized to operate its low-power ATC system in 2483.5-2495 MHz.

Summary of comments

Frequency range

26. Globalstar Canada, Redline and TerreStar supported authorizing ATC in the entire frequency range 2483.5-2500 MHz. Cogeco, Rogers and SaskTel supported authorizing ATC only up to 2495 MHz to address concerns of interference into Broadband Radio Service (BRS) operating above 2500 MHz and to align with the 3rd Generation Partnership Project (3GPP) Band 53 specification. Rogers argued that there was no technical evidence to demonstrate coexistence between the proposed low-power ATC system and BRS systems without any frequency separation.

27. In reply comments, Globalstar Canada confirmed that its ATC operation will use the 3GPP Band 53 specification (2483.5-2495 MHz), adding that it may seek further authorization in the 2495-2500 MHz frequency band at a later date, should a wider TDD channel be standardized by 3GPP in the future.

Mode of operation

28. Redline supported allowing non-forward-band mode of operation on the basis that Canada would benefit from aligning with the U.S. rules.

29. Kepler sought clarification on how interference to other MSS systems would be managed, should the proposed ATC system operate in non-forward-band mode.

MSS spectrum sharing

30. Kepler stated that allowing ATC would prevent new MSS systems from operating in the 2.4 GHz band and urged ISED to ensure that the interests of other MSS operators would be preserved when developing ATC policy.

31. In its reply comments, Globalstar Canada recognized that it will have to share with other future MSS systems in the 2.4 GHz band, subject to standard coordination procedures.

Waiver request for higher transmit power

32. In its comments, Globalstar Canada requested that it be permitted to apply for a waiver of the low-power limit in certain circumstances. Rogers stated in its reply comments that a waiver to permit higher transmit power should only be allowed for a limited commercial trial in the 2483.5-2495 MHz band, subject to ISED examination to ensure that no interference to BRS systems operating above 2500 MHz would result. Rogers opposed any permanent or long-term waiver for commercial purposes without a review of relevant regulations to ensure coexistence with other radio services. Rogers added that exemptions for commercial purposes should be equally applied across all services.

Discussion

Frequency range

33. Globalstar Canada's request for ATC authorization across its MSS spectrum in the 2483.5-2500 MHz band differs from both the U.S. rules (FCC §25.149(a)(2)(iii)) and the 3GPP Band 53 specification, which only cover the 2483.5-2495 MHz band.

34. In the U.S., BRS systems operate above 2496 MHz, providing a 1 MHz guard band between ATC and BRS. ISED notes that frequency separation may be necessary to

ensure compatibility between low-power TDD ATC systems and frequency division duplex (FDD) BRS systems, however does not believe that a full 5 MHz frequency separation would be necessary, given the proposed low-power operation of ATC. Further studies would be required to determine the appropriate amount of frequency separation necessary to ensure coexistence.

35. Considering that the current 3GPP Band 53 specification only covers 2483.5-2495 MHz and that U.S. rules allow ATC in the same range, ISED believes that it is appropriate to align with this current ATC ecosystem and authorize low-power ATC in the 2483.5-2495 MHz frequency range, which also addresses concerns regarding potential adjacent band interference.

Decision

D3
The authorization described in Decision D1, above, is limited to low-power ATC operations in the 2483.5-2495 MHz band only.

Mode of operation

36. When the original ATC policy was developed, ISED took a conservative approach to only allow forward-band mode, since the concept of ATC was still new and given the potential of the other modes to increase inter-system interference.

37. In the case of Globalstar Canada's proposed ATC system, ATC user equipment will, by default, operate in non-forward-band mode when transmitting. This will require interference mitigation measures to facilitate coexistence between ATC and MSS that ISED believes can be addressed through advancements in technology and the introduction of Globalstar Canada's NOS. Through the establishment of its NOS, Globalstar Canada has indicated that it will be able to monitor the state of its ATC operation and resolve any interference issues originating from its ATC system. Globalstar Canada would be able to immediately cease operation until such interference was addressed.

38. Accordingly, ISED believes that if Globalstar Canada is authorized to operate its low-power ATC system in non-forward-band mode, any risk of interference could be mitigated through the appropriate set of conditions of licence.

Decisions

D4
For the purpose of interference mitigation, ISED will require Globalstar Canada to operate a Network Operating System (NOS) in accordance with the conditions of licence in annex A of this Decision.

D5
ISED will allow the operation of a low-power ATC system in non-forward-band mode in the 2483.5-2495 MHz band.

MSS spectrum sharing

39. As acknowledged by Globalstar Canada in its reply comments, it will have to share with future MSS operators in the 2.4 GHz band, in accordance with standard coordination procedures. ISED notes that the 2483.5-2500 MHz band was originally planned on the basis that MSS systems could share the same spectrum using code division multiple access (CDMA). Any new MSS operator wishing to operate in this band would need to also employ CDMA to coexist with Globalstar Canada's incumbent MSS system.

Decision

D6
ISED will maintain the condition that ATC systems shall neither cause harmful interference to, nor claim protection from, any MSS and other primary services operating in accordance with Canadian and international regulations.

Waiver request for higher transmit power

40. ISED notes that higher transmit power could, in general, increase the potential for interference. A key factor in considering an ATC authorization for Globalstar Canada in advance of a formal policy review was the low-power mode of operation, given that it reduces the overall potential for interference, both in-band and in adjacent bands. Further, operations at higher transmit powers would facilitate the deployment of larger cells similar to commercial mobile use, which could require further consultation. As specified in Decision D1, above, it will be a condition of the authorization that only low-power ATC operations are allowed.

7. ATC licences, fees and annual reporting

41. Noting that fee orders have not been established for any spectrum licences for ATC systems, ISED, as an interim measure, proposed to require site-specific radio station licences and associated fees prior to deployment of each installation until a spectrum

licensing approach and associated fees have been established. The applicable licence fee for each site licence would be based on section 72, Fixed Station Communicating with a Station not Otherwise Described, as set out in Schedule III, Part III, item 1, of the *Radiocommunication Regulations*. ISED indicated that the fee for each assigned transmit or receive frequency "channel" would be $41 per "channel" and that for a transmitter and receiver using the same frequency channel, the current annual fee would be $82.

42. Additionally, in terms of reporting, ISED stated that Globalstar Canada would be required to provide an annual report on the number and location of stations in operation.

43. ISED also stated that should an ATC authorization be granted to Globalstar Canada, conditions of licence would be developed to reflect the requirements mentioned in the Notice and further described in Globalstar Canada's application, in addition to other requirements set forth in RP-023.

Summary of comments

44. Both Globalstar Canada and Redline supported the interim fee approach, as proposed. Rogers did not object to the interim fee approach, but urged ISED to prioritize establishing a spectrum licence fee regime for ATC, stating that the current site-specific radio station licence fee could discourage deployment, as a licensee only pays for each station deployed. It also proposed to adopt standard commercial mobile conditions of licence and coverage requirements.

45. Rogers also recommended that the conditions of licence be modified subject to what Rogers proposed in its comments for the 3500 MHz consultation (SLPB-002-19, *Consultation on a Policy and Licensing Framework for Spectrum in the 3500 MHz Band*) on lawful intercept, research and development, and annual reporting. In reply comments, Rogers also indicated that it would support auctioning the ATC rights on a Tier-2 basis.

46. Regarding comments that conditions of licence should be similar to those of commercial mobile services, Globalstar Canada was not in support, given that ATC operation would be ancillary to its primary MSS operations. Globalstar Canada added that since it must manage and mitigate any interference that would result between ATC and MSS use, as well as the fact that its ATC would operate at low power, it would not be feasible to meet standard commercial mobile conditions of licence that, for example, require ubiquitous coverage.

47. SaskTel did not object to the proposals in the Notice, as long as the conditions require adherence to the U.S. rules, including operation in only the 2483.5-2495 MHz band.

48. TerreStar did not oppose the interim fee approach. However, it noted that the fees are lower than what TerreStar was charged for ATC in the 2 GHz band.

Discussion

49. In advance of establishing a spectrum licence fee regime for ATC systems, ISED considers that site-specific radio station licence fees are appropriate, with the payment of fees required prior to the deployment of each installation. As discussed in the Notice, ISED believes that fees should be based on the applicable licence fee for each site licence referenced in section 72, Fixed Station Communicating with a Station not Otherwise Described, as set out in Schedule III, Part III, item 1, of the *Radiocommunication Regulations*. ISED notes that it misstated the applicable fee calculation in the Notice; the correct current annual fee is $41 for each site as indicated in the *Radiocommunication Regulations*.

50. As mentioned in section 5, above, Globalstar Canada's ATC system will operate at low power to support small cell applications, precluding the deployment of higher-power large cells that are characteristic of traditional commercial mobile systems. This differs from the ATC use in 2 GHz, which was the main consideration behind ISED's proposal for a lower interim fee. Furthermore, a fundamental aspect to ATC policy is that ATC systems are ancillary to MSS systems and must cease operation if the associated MSS system ceases operation. These factors make ATC use inherently different from commercial mobile use, and must be considered when establishing both licence fees and conditions of licence, including ubiquitous coverage requirements and lawful intercept. As also mentioned in section 5, ATC services will be complementary, with the primary use of the spectrum continuing to be MSS. Globalstar Canada is subject to conditions of lawful intercept and research and development through its MSS licence, as appropriate. As such, ISED believes that it is not necessary to reiterate such conditions in the ATC licence.

Decision

D7
ISED will require ATC licensees to apply for and maintain a radio licence under the *Radiocommunication Regulations* for each site where it operates radio equipment. The annual interim licence fee for each site licence will be based on section 72, Fixed Station Communicating with a Station not Otherwise Described, as set out in Schedule III, Part III, item 1, of the *Radiocommunication Regulations*. This fee will be subject to the periodic adjustment as specified in the *Service Fees Act*.

Once a spectrum licence fee is established, ISED intends to amend the provision requiring radio licences and authorize operation of equipment through the spectrum licence. At that time, annual spectrum licence fees will be required to be paid.

51. In addition to the requirement to obtain interim radio licences, providing an annual report including the number and location of stations in operation would facilitate the transition from the use of site-specific radio licences to spectrum licences.

Decision

D8
ISED will require Globalstar Canada to report annually on the number and location of stations in operation to facilitate the transition from the use of site-specific radio licences to spectrum licences. Other information required in the report is specified in annex A of this Decision.

8. Next steps

52. As discussed above, the development of ATC in other MSS frequency bands is still ongoing. As the development in these other frequency bands matures, ISED will consult more comprehensively on a review of RP-023.

Annex A: Conditions of licence for the low-power Ancillary Terrestrial Component (ATC) spectrum licence

1. Licence term

The expiry date of this licence is the same as that of the associated mobile-satellite services (MSS) licence. The process for issuing this licence and the associated MSS licence after this term and any issues relating to renewal, including the terms and conditions of the new licence, will be determined by the Minister of Innovation, Science and Industry following a public consultation.

2. Licence fees

The licensee must pay the applicable annual licence fee on or before March 31 of each year for the subsequent year (April 1 to March 31).

3. Site licences and fees

In order to operate radio equipment at any site, the licensee must obtain a radio licence and maintain it in good standing. The applicable licence fees for each site licence are referred to in section 72 and set out in Schedule III, Part III, item 1 of the *Radiocommunication Regulations*, as adjusted annually by the Consumer Price Index or amended from time to time.

4. Eligibility

The licensee must conform to eligibility criteria as set out in subsection 9(1) of the *Radiocommunication Regulations*.

5. Licence transferability and divisibility

This licence is neither transferable nor divisible, except where there is an internal reorganization of the licensee or its affiliate, in which case the licensee may apply to the Minister of Innovation, Science and Industry for authorization for a transfer pursuant to Client Procedures Circular CPC-2-1-23, *Licensing Procedure for Spectrum Licences for Terrestrial Services*.

6. Radio station installations

The licensee must comply with all applicable procedures in CPC-2-0-03, *Radiocommunication and Broadcasting Antenna Systems*, as amended from time to time.

7. Provision of technical information

When Innovation, Science and Economic Development Canada (ISED) requests technical information on a particular station or network, the licensee must provide the information in accordance with the definitions, criteria, frequency and timelines specified in the request. For further information, refer to CPC-2-1-23, *Licensing Procedure for Spectrum Licences for Terrestrial Services*, as amended from time to time.

8. Compliance with legislation, regulations and other obligations

The licensee is subject to, and must comply with, the *Radiocommunication Act* and the *Radiocommunication Regulations*, as amended from time to time. The licensee must use the assigned spectrum in accordance with the Canadian Table of Frequency Allocations and the spectrum policies applicable to this band, as amended from time to time. The licence is issued on condition that all representations made in relation to obtaining this licence are all true and complete in every respect.

9. Technical and operational requirements

The licensee must comply on an ongoing basis with all applicable technical and operational measures in Radio Systems Policy RP-023, *Spectrum and Licensing Policy to Permit Ancillary Terrestrial Mobile Services as Part of Mobile-Satellite Service Offerings*, as amended from time to time, except as specified in SMSE-009-20, *Decision on Globalstar Canada's Application for Ancillary Terrestrial Component (ATC) Authority in the 2.4 GHz Band (2483.5-2500 MHz)*, as amended from time to time.

Specifically, the 2.4 GHz low-power ATC system must meet the following technical and operational requirements:

a. Equipment shall operate in the 2483.5-2495 MHz frequency band.

b. The transmitted signal shall be digitally modulated.

c. The 6 dB bandwidth shall be at least 500 kHz.

d. Transmitter output power shall not exceed 0 dBW.

e. The maximum equivalent isotropically radiated power (e.i.r.p.) shall not exceed 6 dBW.

f. The equipment's maximum power spectral density conducted to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

g. For the unwanted emission below 2483.5 MHz, the ATC system's transmitter power, P (Watt), shall be attenuated by at least:

   i. 40 + 10 log(P) dB at the channel edge at 2483.5 MHz

   ii. 43 + 10 log(P) dB at 5 MHz from the channel edge

   iii. 55 + 10 log(P) dB at X MHz from the channel edge

where X is the greater of 6 MHz or the actual emission bandwidth.

h. For the unwanted emission above 2495 MHz, the ATC system's transmitter power, P (Watt), shall be attenuated by at least:

   i. 43 + 10 log(P) dB on all frequencies between the channel edge at 2495 MHz and X MHz from this channel edge

   ii. 55 + 10 log(P) dB on all frequencies more than X MHz from this channel edge

   where X is the greater of 6 MHz or the actual emission bandwidth.

i. Notwithstanding the above requirements, the e.i.r.p. density of the ATC system's unwanted emission shall not exceed:

   i. -44.1 dBW/30 kHz measured from the edge of the equipment channel bandwidth

   ii. -70 dBW/MHz for broadband emissions and -80 dBW/kHz for discrete emissions in the band 1559-1610 MHz

j. Compliance with this limit may be based on the use of a measurement resolution bandwidth of at least 1% of the occupied bandwidth. If 1% of the occupied bandwidth is less than 1 MHz, the power measured shall be integrated over the required measurement bandwidth of 1 MHz.

k. The 2.4 GHz low-power ATC system meeting the technical requirements in this section may operate in non-forward-band mode.

l. The 2.4 GHz low-power ATC system meeting the technical requirements in this section is not required to use dual-mode user equipment.

m. The ATC licensee shall utilize a Network Operating System (NOS), consisting of a network management system located at an operations centre or centres. The NOS shall have the technical capability to address and resolve interference issues related to the licensee's network operations by:

   i. reducing operational power

   ii. adjusting operational frequencies

   iii. shutting off operations

   iv. any other appropriate means

   The NOS shall also have the ability to resolve interference from the terrestrial low-power network to the licensee's MSS operations and to authorize access points to the network, which in turn may authorize access to the network by end-user devices. The NOS operations centre shall have a point of contact in Canada available 24 hours a day, seven days a week, with a phone number and address made publicly available by the licensee.

n. All access points operating in the 2483.5-2495 MHz band shall only operate when authorized by the ATC licensee's NOS, and all client devices operating in the 2483.5-2495 MHz band shall only operate when under the control of such access points.

The ATC operation must not constrain the deployment of the MSS satellite networks associated with this licence.

10. Domestic and international coordination

Where applicable, the licensee must use its best efforts to enter into mutually acceptable agreements with other parties for facilitating the reasonable and timely development of their respective systems, and to coordinate with other licensed users in Canada and internationally.

The licensee must comply with the obligations arising from current and future frequency coordination agreements established between Canada and other countries, and shall be required to provide information or take action to implement these obligations as indicated in any applicable Standard Radio System Plan (SRSP).

11. Mandatory antenna tower and site sharing

The licensee must comply with all applicable mandatory antenna tower and site sharing requirements set out in CPC-2-0-17, *Conditions of Licence for Mandatory Roaming and Antenna Tower and Site Sharing and to Prohibit Exclusive Site Arrangements*, as amended from time to time.

12. Implementation of spectrum usage

The ATC licensee must demonstrate to the Minister of Innovation, Science and Industry that the licensed spectrum has been put to use by the end of the licence term.

13. Deployment related to provision of MSS

The low-power ATC licence is only valid provided that the MSS licence is valid and in good standing. In order to maintain good standing, the licensee must demonstrate to the Minister of Innovation, Science and Industry that the MSS associated with the low-power ATC authorization in the 2.4 GHz band continues to be offered within the MSS licensed area on an ongoing basis.

In the event of catastrophic failure of a number of satellites in the constellation resulting in the inability of the MSS licensee to fulfill its obligation to provide and maintain meaningful MSS in Canada, the MSS licensee shall endeavour to restore the MSS to a fully operational state within 48 months. The associated low-power ATC system shall cease operation if the MSS is not fully restored and operational within 48 months.

14. Annual reporting

The licensee must submit an annual report for each year of the licence term, including the following information:

a. a statement indicating continued compliance with all licence conditions

b. an update on the implementation and spectrum usage within the area covered by the licence

c. the number and location of stations in operation to facilitate the transition from the use of site-specific radio licences to spectrum licences

d. other information related to the licence as specified in any notice updating the reporting requirements as issued by ISED

All reports and statements are to be certified by an officer of the company and submitted in electronic format (Microsoft Word or PDF), within 120 days of the licensee's fiscal year end, to the Manager, Operational Policy, Spectrum Management and Operations Branch, at ic.spectrumoperations-operationsduspectre.ic@canada.ca.

Where a licensee holds multiple licences, the reports should be broken down by service area.

Confidential information provided will be treated in accordance with subsection 20(1) of the *Access to Information Act*.

15. Amendments

The Minister of Innovation, Science and Industry retains the discretion to amend these terms and conditions of licence at any time.