

**Canada Gazette, Part I, June 2024, Consultation on a Policy,
Licensing and Technical Framework for Supplemental Mobile
Coverage by Satellite, notice reference number SMSE-006-24**

Contact information

Elisabet Fonalleras
Regulatory Affairs Manager
elisabet.fonalleras@sateliot.com

Mariona Pazos
Regulatory Affairs and Licensing Specialist
mariona.pazos@sateliot.com

Date: 13/09/2024

Innovation, Science and Economic Development Canada

Spectrum Licensing Policy Branch
Senior Director, Regulatory Policy
6th Floor, East Tower
235 Queen St
Ottawa ON K1A 0H5

Overview

1.1. Introduction

Satelio IoT Services (Sateliot) thanks ISED for the opportunity to address the proposed Supplemental Mobile Coverage by Satellite (SMCS) consultation. Sateliot acknowledges and welcomes the policy objectives outlined in the consultation and included below for the sake of completeness.

ISED's policy objectives for this consultation are:

- To expand mobile services, particularly in unserved and underserved areas, including rural, remote, and Indigenous communities;
- promote competition in the provision of wireless services so that consumers and businesses benefit from greater choice and competitive prices;
- support increased reliability and resiliency of telecommunications services
- foster investment and the evolution of wireless networks by enabling the development of innovative and emerging applications.

To set the scene and the importance of satellite connectivity for everyday cellular devices, Sateliot reiterates ISED's notes that mobile service coverage gaps persist in Canada owing largely to its vast and unique geography and that *"87.7% of major roads and highways have access to mobile wireless coverage, leaving 14,036 Km of roads and highways with no connectivity"*.

It is under these circumstances that Sateliot, as a global 3GPP NB-IoT NTN service provider, wishes to comment on the proposed SMCS framework, paying special attention to:

- [supplemental SMCS services are] "essential for Canadians to access basic mobile services and emergency services such as 9-1-1."
- "ISED considers that SMCS falls under MSS given that transmissions would be directly between satellites and mobile devices"
- "As part of this consultation, ISED aims to develop a framework that will enable SMCS as soon as the first offering, which is expected to be texting, becomes available and as it develops."
- "Canadian satellite spectrum policies typically follow allocations, and regulatory and technical rules as set in the ITU Radio Regulations"

1.2. Introduction to Sateliot

Founded in 2018, Sateliot is a Spanish company and the first satellite operator to deliver IoT (Internet of Things) connectivity through the 5G NB-IoT NTN standard, approved by 3GPP in June 2022 as an extension of the 5G terrestrial standard.

Sateliot's constellation act as cell towers in space, extending the coverage of mobile network operators and providing global connectivity to commercial terrestrial devices without modification wherever they are. Our service offers connectivity based on the 3GPP NB-IoT NTN standard protocol, which allows the service to be widespread at a low cost.

Similar to what is being proposed in the SMCS framework, Sateliot provides its services in close cooperation with existing MNOs. However, Sateliot's standard-base approach means that MNOs are not required to modify existing infrastructure nor devices. In this vein, Sateliot and the MNO

enter a standard GSMA roaming agreement, through which MNOs extend their coverage seamlessly and their existing clients gain our satellite network.

This model is dependent on Sateliot entering a commercial partnership with MNOs looking to expand their network coverage. Therefore, Sateliot does not compete with MNOs and holds no commercial relationship with end-users. Furthermore, the standardized model adopted by Sateliot allows for mass rollout at an affordable rate, which we predict to be at USD 2 per device a month on average. Existing terrestrial IoT devices already available on the consumer market can connect to Sateliot's constellation. This has the potential to unlock connectivity in vast regions of Canada where today is uneconomical for terrestrial networks.

In our journey towards global service activation, Sateliot seeks to operate as a wholesale satellite network operator, acquiring the required licenses to do so, but without providing services directly to end-users as previously mentioned, hence this consultation is of utmost importance for us.

Sateliot is deploying a Low Earth Orbit constellation: in August this year, 4 commercial satellites were launched, and with these 4 satellites, we will commence service provision for delay-tolerant applications immediately. Sateliot's final constellation will consist of around 491 satellites to be launched in the coming years.

Our services are provided entirely through ITU-R-conforming MSS designated bands by 3GPP. For the sake of clarity, the standard 3GPP 5G NB-IoT for NTN frequency bands are as follows:

NTN Satellite Band	Uplink (UL)	Downlink (DL)	Duplex mode	Space Duplex
255	1626.5 – 1660.5 Mhz	1525 Mhz – 1559 Mhz	FDD	101.5 Mhz
256	1980 – 2010 Mhz	2170 Mhz – 2200 Mhz	FDD	190 Mhz

For additional background – and relevant to this consultation – in 2023, Sateliot submitted a request for exceptional regulatory action to grant a market access authorization for our smallsat system, which is still under consideration. Our commitment to Canada NTN supplemental coverage was unwavering then, and it remains so today. The Canadian IoT market is growing exponentially, and the country's geography requires NTN systems and solutions that are designed for the purpose and which provide connectivity to the entire territory. Sateliot will continue working with ISED towards achieving the realization of our system's service provision for Canadian mobile operators.

Once again, we express our gratitude to ISED for the opportunity to provide inputs on this important consultation regarding the proposed Supplemental Mobile Coverage by Satellite (SMCS) framework. We commend ISED's collaborative efforts in shaping regulatory frameworks that drive innovation and integrate advanced technologies seamlessly, thus helping improve the state of connectivity.

1.3. NTN coverage for Mobile Operators, the case of IoT

Supplemental coverage from space, popularly known as Direct-to-Device (D2D), is not limited to smartphone-centered services – it also includes connectivity for IoT devices (also part of the IMT ecosystem) which operate usually over terrestrial cellular networks. The importance of conceiving all the technologies involved in the NTN supplemental coverage ecosystem is crucial for completeness in regulatory action and policy reform. This supplemental coverage can be provided using partner MNO's terrestrial spectrum, but also using existing Mobile Satellite Systems (MSS), with particular interest in L and S-Bands.

In the last decade, IMT has undergone a revolution with mass adoption at the commercial and consumer level. Advancements in IoT device capabilities and precision have proven to be a valuable addition to all sectors of the economy.

Today, IoT devices are being used in many key areas of the economy. These include:

- In agriculture for precision farming, soil monitoring and crop and livestock monitoring
- In mining and oil and gas extraction for safety, environment monitoring and maintenance monitoring
- Shipping and logistics for tracking and cargo monitoring
- Manufacturing for safety, equipment assessment and autonomous machines

In assessing the satellite component of IMT and the expansion of novel satellite services, it is important to consider all the work developed at ITU level in recent times.

IMT and its satellite component date back to the original IMT-2000 at WRC 1992 where the need for a satellite component was also identified. The General Framework on the Satellite Component of IMT-2000 was published in Recommendation ITU-R M.1167. The recommendation considered the different characteristics of satellite and terrestrial components of IMT towards developing a global integrated system that includes Machine-to-Machine (M2M) communications.

The work continued throughout subsequent WRC cycles, with notable summarized developments including:

- **WRC 2007** which revised Resolution 212 by identifying bands 1980-2010 Mhz and 2170-2000 Mhz for the satellite component of IMT.
- **WRC 2012** adopted Resolution 225 identified frequency bands 1518-1 544 MHz, 1545-1559 MHz, 1610-1626.5 MHz, 1626.5-1645.5 MHz, 1646. 5-1660.5 MHz, 1668-1675 MHz and 2483.5-2500 MHz may be used by administrations wishing to implement the satellite component of IMT, subject to the regulatory provisions relating to the mobile-satellite service in these bands.
- **WRC 2015** Resolution 2126 invited the ITU-R to study the possibility of the satellite component of IMT in the bands 1980Mhz-2010 Mhz and 2170-2200 Mhz. These bands are shared between IMT and satellite across many countries.
- **WRC 2019** studies on the coexistence between the satellite component and the terrestrial component of IMT resulted in the revised Resolution 212 looking at operational measures for coexistence in 1980-2010 Mhz and 2170-2200 Mhz.
- **WRC 2023** Agenda Item 1.18 looked at further allocations for MSS for NB systems.

Today, SMCS is planned to operate in a regulatory void outside of the ITU Radio Regulations, in terms of satellite and mobile allocations. While the satellite component of IMT has a long-standing history of study for coexistence and interference-free operation, SMCS through Mobile Service (MS) in mobile bands has not had the equivalent level of study yet. As indicated throughout ISSED's

consultation, AI 1.13 of the current WRC-27 cycle is considering said technical studies.

The provision of expanded network coverage through the satellite component of IMT, which in practice means MSS bands, is well understood and can operate safely in commercial environments. Particularly, the provision of supplemental satellite capacity through 3GPP standardized bands (L and S-Band MSS) represents the most sustainable and well-understood method. This service requires no modification to existing terrestrial infrastructure, allows for collaboration between satellite and terrestrial network providers and an expanded network coverage area. The bands have been studied and service can be provided free of harmful interference.

Dedicated spectrum for the MSS remains crucial for effective deployment, and regulatory frameworks should align with standards and best practices. It is important, however, that administrations avoid introducing regulatory changes prematurely and instead wait for the outcomes of WRC-27 studies. While promoting SMCS through MS is valuable, this should be done in a way that ensures proper study completion, avoiding unnecessary risks of interference. Current efforts, such as AI 1.13, aim to designate these bands for MSS, which ensures a measured approach.

Lastly, when developing a regulatory framework for SMCS, administrations should be careful not to favor specific operators or methodologies. Ensuring adherence to technology neutrality is key, as it fosters healthy competition and ultimately benefits consumers. Policies should change the technological landscape without leading to outcomes that stifle market competition.

Considerations for The Proposed Frequency Bands

1.4. Bands proposed to be used for SMCS in Canada

Sateliot understands and appreciates the selection of bands such as 600 MHz, 700 MHz, 800 MHz, PCS, AWS-1, and AWS-3 for supplemental satellite coverage due to their propagation and capacity characteristics, but we are left wondering why certain bands within the range proposed by Agenda Item 1.13 are not being considered.

We do not oppose the band selection, but we are wary of the potential undermining effect of excluding other IMT bands in this range which are being considered under AI 1.13. This exclusion could reduce market access opportunities for interested operators post-WRC-27, and it may provide an unintended competitive advantage to a limited set of systems at this stage, potentially impacting the broader spectrum landscape and limiting opportunities for future players to the detriment of Canadians.

1.5. Bands proposed by AI 1.13 WRC23

WRC-23 proposed studies for potential MSS allocations into IMT bands between 690 MHz to 2.7 GHz, largely recognizing the suitability of the L- and S-Bands for connectivity between satellites and IMT user equipment. It is encouraging that ISED acknowledges the importance of this Agenda Item for the future of supplemental NTN coverage for IMT outside terrestrial networks.

There are several elements to consider once studies conclude and if bands are to be licensed among MSS operators in Canada post-WRC-27, providing capacity for MNOs:

Accessibility and Usage (Handset vs IoT): The distinction between handset and IoT use cases is

critical. Handsets typically require low-latency, high-bandwidth connectivity with robust user experience, whereas IoT devices may operate with different requirements in terms of latency and data throughput. The design and allocation of spectrum should reflect these varied needs to ensure optimal performance and user experience across all applications. Handsets generally demand more robust and higher-capacity allocations, while IoT devices might benefit from more flexible, cost-effective spectrum access.

Business Models (Proprietary versus Standardized): The choice of business models in this spectrum allocation—whether proprietary or standardized—will significantly impact market dynamics. Proprietary models may offer tailored solutions and competitive advantages but risk creating fragmented ecosystems and higher costs. In contrast, standardized models, often driven by international agreements and harmonized regulations, can foster interoperability, reduce costs, and stimulate broader adoption. While this discussion may apply broadly, it has particular relevance for IoT services, as the decision between these models will influence both deployment strategies and the market structure for MSS and IMT services.

1.6. Considerations for the proposed frequency bands

In response to Question 1

While Sateliot does not object to any specific band, the selection must be cognizant of existing services and in-band and out-of-band interference. This is particularly important considering the unstudied and largely untested nature of SMCS through MS. It is important that regulatory action is based not on preliminary study results but rather on technical evidence. Sateliot also supports reserving specific frequency bands, such as those identified by 3GPP for NB-IoT NTN (e.g., Bands 255 and 256), which are critical for maximizing the social and economic benefits of satellite IoT technologies in Canada. These bands are supported across all three ITU regions and are suitable for FDD use, aligning with industry standards and ensuring a robust and consistent approach.

SCS in the United States has seen Omnispace reporting interference concerns, specifically, with Starlink's D2D services. These reports highlight potential challenges in coexistence between satellite services operating in similar frequency bands, with Omnispace claiming that Starlink's payloads caused disruptions to their MSS network.¹

There are additional considerations in the global trend of regulatory exceptionality. This is evidenced by the adoption of SMCS through the MS approach in the United States, which relies on Article 4.4 of the ITU RR. Art 4.4 was never intended to be used for large-scale commercial operations. Systems operating under this Article do so on a no-protection and no-interference basis. This means that SMCS through MS could potentially provide last-mile connectivity in rural areas, but any interference would shut the system down. This is particularly damaging when such connectivity is the only means through which a user can communicate or in worst case scenarios rely on for emergency communications.

It is therefore imperative that service to be relied upon at a commercial scale operates under an understood regulatory and technical framework which has already undergone the requisite coexistence studies. Implementing dedicated spectrum allocations, as opposed to relying on Article 4.4 of the ITU Rules, will ensure optimal performance and minimize disruptions, particularly in applications requiring high reliability and interference management. This approach prioritizes the dedicated allocation of spectrum, ensuring that critical applications can operate without risk of

¹ <https://spacenews.com/omnispace-reports-interference-from-starlink-direct-to-device-payloads/>

interference that could compromise service reliability. This makes, for now, the MSS model and the standardized 3GPP 5G NTN model the only viable solutions.

In response to Question 2

One of the key advantages of using MSS dedicated spectrum for D2D services is the effective management of interference, especially during service handovers. Given that the proposed secondary MSS allocations via footnotes to the Radio Regulations would allow operations on a no interference, no protection basis, it remains crucial to select frequency bands and geographic areas where there is minimal risk of interference with existing services.

Therefore, both the size of the service area and the presence of mobile service providers using the same frequency block should be considered to ensure that the chosen bands facilitate the smooth operation of the SMCS framework while minimizing potential interference issues. Given the narrowband nature of NB-IoT NTN transmissions, the spectrum requirements are modest but critical, typically needing a few hundred kHz per channel. As demand grows, ensuring dedicated and exclusive spectrum allocation will be essential to prevent interference and maintain service reliability.

In response to Question 5

As stated in section 1.4, Sateliot acknowledges the selection of bands like 600 MHz, 700 MHz, and AWS blocks for satellite coverage due to their characteristics. However, we question the exclusion of certain bands under Agenda Item 1.13. While we don't oppose the current choices, leaving out these bands could limit market access post-WRC-27, giving an unintended advantage to a few systems and restricting future opportunities, ultimately disadvantaging Canadians.

1.7. Policy Considerations for Proposed Bands

In response to Question 7

Sateliot wishes to stress that this allocation is pre-emptive of prospective WRC-27 outcome, and is not currently backed by ITU study results. This poses a significant risk of commercial failure and potential communication failures that could result in human lives being at risk, especially in critical or emergency scenarios. Communication services must be rolled out in accordance with tried and tested technology which can ensure co-existence with existing services.

SMCS provided through the MS model is not yet suitable until the required studies have been completed and until there is an understanding of the limitations and guidelines for ensuring co-existence.

In response to Question 8

Providing services on a no-interference and no-protection basis under Article 4.4 is not suitable for widespread commercial use, as it cannot ensure service quality or reliability, particularly for critical communications like emergencies. Existing MSS services and emerging 3GPP standardized services solutions already address these needs effectively. For any reliable service rollout, the ITU study process must be completed to establish proper recommendations. Until then, services operating under such restrictions are unreliable and inconsistent with harmonized international regulations, making them unsuitable for commercial or critical applications.

Emergency services and network reliability

In response to Question 11

While Sateliot's technology is not specifically designed to provide emergency communications, we emphasize that SMCS systems must be rigorously evaluated to meet network reliability and resilience requirements as outlined in the MOU on Telecommunications Reliability.

Systems not initially built for emergency response may lack the necessary robustness to handle critical outages. IoT services, however, can play a vital role in monitoring and anticipating disasters in high-risk areas. Ensuring that SMCS frameworks include well-defined protocols for resilience and emergency backup is essential before licensing, particularly given the critical importance of maintaining network reliability during crises.

The Proposed SMCS Licensing Framework

1.9. License Terms and Conditions

In response to Question 20:

Sateliot supports the concept of implementing roaming agreements for service provision and acknowledges the benefits of such agreements, especially where they enhance efficient spectrum access and guarantee service quality. As a pioneer in promoting and utilizing roaming agreements under GSMA's framework, Sateliot recognizes its value in expanding service coverage and operational flexibility, as well as regulatory certainty for all involved parties.

However, we believe that imposing a mandatory roaming requirement as outlined in Option 1 where such a requirement would take effect five years following the publication of a decision may not always be necessary or optimal in all cases. Roaming agreements should be encouraged as a best practice, but they do not need to be mandated by spectrum licensing conditions.

Forcing mandatory roaming could inadvertently limit flexibility and stifle innovation by imposing rigid conditions that may not align with the diverse needs of different operators and or capacity off-takers. Instead, fostering an environment where operators are motivated to establish roaming agreements voluntarily, based on mutual benefits and market dynamics, could lead to more effective and tailored solutions. Therefore, while we operate by establishing roaming agreements with over MNO partners, we recommend against making them a compulsory condition at spectrum licensing stage, as this could impose unnecessary constraints on operators and potentially hinder the development of a more flexible and innovative service arrangement.

Technical considerations

1.10. Technical requirements for SMCS space stations

In response to Question 23

In terms of technical requirements and coexistence measures, aligning these parameters helps ensure consistency across different platforms operating in the same frequency bands, reducing the risk of harmful interference between terrestrial and satellite services.

However, additional technical requirements, such as Enhanced Interference Mitigation or Dynamic Spectrum Management should be considered by ISED towards the implementation of SMCS. These include stricter limits on spurious emissions and clearer coordination protocols with terrestrial networks.

Because the proposed use of Mobile / IMT spectrum is studied under AI 1.13 and some of these additional technical studies may emerge during the study cycle, we would be supportive of awaiting the completion of the WRC-27 cycle in this regard.

Our view is that current standards provide a solid foundation for terrestrial operations but may require adjustments to fully support the concept proposed by SMCS and would account for the unique propagation characteristics of space-based systems.

1.11. Interference Considerations

The SMCS framework which would allow for direct-to-device connectivity on a Non-Interference, Non-Protected (NINP) basis introduces critical considerations for managing interference.

Mitigating interference in-band, out-of-band and in the contiguous terrestrial operations requires a multifaceted approach or technical solutions such as (but not limited to):

- power control
- dynamic spectrum access
- advanced filtering
- strategic coordination between satellite and terrestrial operators
- adherence to regulatory standards

All of these techniques present operational complexities and high cost implications that widely available massive commercial services may not allow for.

Other Considerations

Within the context of the consultation, it is essential that the Future Spectrum Outlook for the 2 GHz band be considered, particularly with the introduction of Satellite Mobile Communication Services (SMCS). This consideration is crucial to ensure and promote a diversity of MSS (Mobile Satellite Services) that can provide significant benefits to the Canadian economy and society. By integrating these services into spectrum planning, Canada will be better positioned to leverage the emerging opportunities that these services can offer.

Furthermore, a potential harmonization between the Canadian Table of Frequency Allocations and the 3GPP standard would enable Canada to fully benefit from the complete ecosystem of devices that will be developed for this technology. This harmonization would not only facilitate the efficient implementation of services but also ensure that Canada remains aligned with global technological trends, enabling broader and more competitive access to next-generation technologies.

Finally, and as it is known to ISED, Sateliot has advocated internationally for the dedication of specific frequency blocks within the bands identified by 3GPP for NB-IoT NTN (1980-2010 MHz and 2170-2200 MHz), in order to maximize the social and economic benefits of satellite IoT.