

## Comments of Intelsat US LLC

### ***Consultation on the Technical and Policy Framework for the 3650-4200 MHz Band and Changes to the Frequency Allocation of the 3500-3650 MHz Band (SLPB-002-20)***

**October 26, 2020**

#### **I Introduction and Executive Summary**

1. These are the comments of Intelsat US LLC, (f/k/a Intelsat Corporation) (“**Intelsat**”) to Innovation, Science and Economic Development Canada’s (“**ISED**”) *Consultation on the Technical and Policy Framework for the 3650-4200 MHz Band and Changes to the Frequency Allocation of the 3500-3650 MHz Band* (“**Consultation**”).
2. Intelsat understands and appreciates ISED's intent of repurposing spectrum in the 3700 MHz to 4200 MHz band (“**C-band**”) to accommodate flexible use for fixed and mobile services – namely to free up additional valuable spectrum that can be used to support Canada's world class wireless infrastructure and next generation connectivity, i.e., 5G. As in other countries around the world, the contemplated repurposing of the C-band in Canada is an undertaking of unprecedented technical complexity that would require existing C-band satellite operators such as Intelsat to incur significant financial expenditures and implement a multitude of operational changes necessary to clear the band, while ensuring important continued service to existing users of C-band fixed satellite services (“**FSS**”).
3. Intelsat believes that any repurposing of C-band spectrum to accommodate flexible use for fixed and mobile services should be based on the recognition of the value that satellite services bring to the Canadian economy, and on the premise that the services provided to our customers on our C-band satellites must be protected and allowed to continue seamlessly without disruption or degradation in quality. C-band is a key enabler for the Cable TV ecosystem with a subscription base of over five million households and over \$4 billion Canadian dollars in revenue. Additionally, ad revenues that are attributed to multichannel TV exceed \$1.3 billion Canadian dollars in 2020.<sup>1</sup>
4. Given the enormity and complexity of this unprecedented task of reallocating the band from fixed satellite to a completely different form of communications – next generation terrestrial mobile – it is reasonable to anticipate that the arduous effort of clearing the band in Canada will take until at least December 2025. However, if properly incentivized, Intelsat believes the satellite industry can accomplish ISED’s policy objectives by clearing a portion of the 3700-3900 MHz band for 5G deployment by mobile operators in Canada on an even more accelerated timeline

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<sup>1</sup> S&P Market Intelligence.

than that contemplated by ISED, thereby maximizing the benefits to Canada of this ambitious repurposing of a large amount of valuable spectrum.<sup>2</sup> This accelerated clearing can be accomplished through an approach that will meet the reasonable requirements of all stakeholders, including incumbent operators, C-band users and 5G mobile network operators and incentivize these parties to collaborate to achieve this goal in an efficient manner to meet the needs of Canadians. In these comments, including its responses to ISED's specific questions in the Consultation, Intelsat will outline a principled approach that will satisfy these requirements.

5. These principles would recognize:
  - a. The significant value of satellite services currently provided by Intelsat and other satellite operators to Canadians, the media distribution ecosystem, and to remote communities across Canada.
  - b. The significant value of the C-band spectrum being repurposed as an enabler of next generation services – not just for 5G operators, but also for the Canadian public and the Canadian economy;
  - c. The importance and value of repurposing this spectrum within a timeframe and in a manner that not only makes this spectrum available for 5G at the earliest opportunity, but also minimizes the impact on existing customers in the band;
  - d. The significant role to be played and costs to be incurred by all domestic and foreign satellite operators alike – primarily, Intelsat, Telesat and SES – in clearing the band for these next generation uses;
  - e. The need for equal treatment of all domestic and foreign satellite operators serving Canada in a manner that recognizes the unique challenges that reallocating the C-Band for 5G creates for these satellite operators and the financial and operational impact on these operators in enabling this transition; and
  - f. For both domestic and foreign C-band operators, the loss of use of the full 500 MHz of the band, together with the significant destruction of the net present value of their long-term investments made in good faith to serve customers in the band under authorizations granted by ISED.
  
6. As ISED is aware, in the U.S. the Federal Communications Commission (“**FCC**”), after much deliberation, ultimately determined that it would auction 280 MHz of spectrum in the band. As part and parcel of that approach it also determined that satellite operators providing FSS in this band should be compensated to cover the significant costs of clearing the band, as well as financially incentivized to clear on an accelerated basis, all while ensuring continued service to existing users of C-band services. This compensation will be paid to both domestic satellite providers, as well as those non-U.S. providers – e.g. Telesat – with market access rights and

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<sup>2</sup> Consultation, paras. 3-6.

services in the U.S. that parallel those of Intelsat in Canada. The nationality of the operator had no bearing on its share of compensation.

7. In Canada, Intelsat, along with Telesat and SES, provides FSS in the C-band, pursuant to authorizations issued by ISED. As recognized in the Consultation, due to existing infrastructure and the propagation characteristics of the C-band, it continues to be heavily used to distribute media and provide Internet connectivity. Indeed, many rural and remote areas currently rely on C-band services for telephony, broadcast distribution, backhaul, and Internet services. These existing services remain critically important to many Canadians and will continue in importance after the rollout of 5G terrestrial services in more heavily populated areas.
8. Intelsat provides important FSS services to Canadians, with a significant share of earth stations in Canada. Over its satellite networks, Intelsat provides C-band services to hundreds of CBC sites, delivering video of national sporting events, e.g., curling and hockey, syndicated broadcasting services and serving energy companies in Canada's mining and oil industries (including ocean platforms) and provides critical communications services to rural communities. Furthermore, Intelsat delivers over 50% of the cable TV channels distributed by C-band in Canada. This includes non-Canadian and Canadian versions of U.S.-branded Channels. Furthermore, Intelsat covers Canada from a variety of orbital positions stretching from the Atlantic to the Pacific which makes it uniquely capable
9. When evaluating and implementing the significant measures required for the repurposing of the C-band, recognition should be given to the legitimate interest of all stakeholders. Measures adopted should provide equitable compensation for all incumbent FSS providers for their significant investments in, and loss of use of, the band, as well as to incentivize their engagement in the significant cooperative efforts required in order to repurpose this spectrum for 5G in the timeframe envisioned by ISED. Each satellite operator must take responsibility for the efforts necessary to migrate its own C-band customers. This will best permit these operators to fund and implement the measures necessary to clear the band for next generation connectivity services, while ensuring important continued service to existing FSS customers, all in a manner consistent with the Canadian legislative and regulatory framework, as well as policies and commitments of the Government of Canada.
10. Intelsat therefore conditionally supports ISED's proposal to repurpose the lower 300 MHz for flexible use through the repacking of C-band FSS in the 4000 – 4200 MHz band outside of satellite dependent areas, the creation of a 20 MHz guard band at 3980 – 4000 MHz, and other technical measures discussed in response to questions asked in the Consultation.
11. Any such repurposing of the spectrum must observe the principles set out above, including compensation for C-band operators. This compensation can be implemented out of the reserve price set for the spectrum auctioned by ISED.

Based on its preliminary analysis, Intelsat believes it is entitled to no less than 25% of such compensation arising from proceeds of the C-Band auction.

12. In addition, there are potentially significant benefits to be realized by auctioning the spectrum in the C-band at the same time as, and as part of, the same auction already planned for the 3450-3650 MHz band, rather than by delaying the auction for the C-band a further two years, as proposed by ISED in the Consultation.

## II Intelsat's FSS C-band Services

13. Intelsat is the leading provider of FSS worldwide, serving the media, network services, and government customer sectors. Intelsat owns and operates a global satellite network providing space and terrestrial capacity, which offers a wide array of communications services, including voice, video, data, and Internet connectivity. Intelsat's fleet of satellites covers more than 99 percent of the world's populated regions, serving customers that range from large telecommunications carriers and broadcasters to corporate networks and Internet service providers. Intelsat's customers include distributors that resell capacity, as well as customers that purchase capacity for their own use.
14. Intelsat has been operating in Canada for decades and provides important FSS services to Canadians in the C-band, with a significant share of earth stations in Canada, looking at its' Galaxy 19 and Galaxy 15 satellites in particular.
15. As noted by ISED in the Consultation, the C-band is already extensively used to deliver satellite signals to licensed and unlicensed earth stations throughout Canada, reflecting their particular importance to the Canadian broadcasting industry. In particular, in Canada, as elsewhere, C-band transmissions form an important element of the delivery of content for the television industry.
16. Intelsat's satellites transmit a significant share of media content to millions of Canadian households and those providing programming to them. These activities include:
  - a. serving hundreds of Canadian Broadcasting Corporation ("CBC") sites for the delivery of video content;
  - b. delivering both U.S. originating signals and content for Canadian signals to the head-ends of a large number of Canadian cable systems serving the majority of Canadian households, including both Multiple System Operators and smaller members of the CCSA; and
  - c. transmission of key sporting events, including national events such as curling and hockey as well as other major league sporting events, such as NFL, MLB games and professional golf
17. Not just Canadian, but U.S. and international content producers and channels rely on Intelsat satellites to get their programming to Canadian TV distributors for

onward distribution to Canadians households. Intelsat estimates that it is responsible for a 50% share of all channels distributed in Canada by C-band.

18. Although content distribution models have evolved since the 1970s, the need for the C-band as an essential link in the distribution chain remains constant. Video programmers rely on the unparalleled quality and dependability of C-band FSS to provide video programming to Canadian households. The C-band also supports government and public safety operations, provides critical links to remote and underserved areas, and ensures communications systems' availability during natural disasters when terrestrial services fail. C-band satellite distribution technology today offers 99.999% reliability, a.k.a. "five nines" reliability – as required by video programmers.
19. In any cost-benefit analysis, ISED must account for the fact that C-band satellite distribution ensures that outages to must-see events such as major sports and news events do not occur. For video content and other customers that require highly reliable nationwide distribution networks, alternate spectrum bands and technologies are not adequate substitutes for the C-band. Other technologies do not match the C-band's reliability, coverage, and cost-effectiveness. Fibre, for example, is not available everywhere, is prone to network outages that can take time to pinpoint and resolve, and is very costly for distributing common services such as cable programming to a large number of locations. Fibre may also be prohibitively expensive for some users due to the high costs associated with content handoff among multiple network vendors. With certain live events, any loss of broadcast coverage due to the unavailability of the C-band or the use of inferior alternatives would be catastrophic for Canadian broadcasters and Canadian viewers.
20. The increasing availability of 4K- and eventually 8K- offerings from television broadcasters provides additional revenue opportunities that will only be possible if sufficient transponder capacity remains that can provide the five nines of reliability that broadcasters expect.
21. To receive communications from geostationary satellites 36,000 kilometres away, C-band earth station antennas are highly sensitive by design and, consequently, extremely vulnerable to interference. Specifically, protecting reception of satellite signals from co-frequency terrestrial interference would require large exclusion zones around the satellite earth stations. Establishing exclusion zones around FSS earth stations would also constrain terrestrial operations significantly. Possibilities to mitigate interference on a global basis are extremely limited, and dynamic spectrum sharing solutions, which remain unproven, are inherently and fundamentally incompatible with the nature of FSS receive earth stations. Any viable approach to expanding mobile broadband operations in the C-band would preclude co-frequency sharing.

22. Currently, some 26 satellites operated by Intelsat are included on ISED's *List of Foreign Satellites Approved to Provide Fixed-satellite Services (FSS) in Canada*. The majority of these satellites use the C-band for the downlink portion of Intelsat's network. These C-band services are provided pursuant to authorizations granted to Intelsat by the Minister under the *Radiocommunication Act*. These authorizations were issued to Intelsat for its space stations authorized by various World Trade Agreement Member administrations under the liberalized international satellite services regime ushered in through the *GATS Agreement on Basic Telecommunications* ("**GATS**"). Under the GATS, Canada's schedule of specific commitments includes among other things, market access and national treatment commitments respecting basic telecommunications services, including FSS as of 2000.<sup>3</sup>

23. As discussed further below, in Intelsat's opinion, all C-band satellite operators as an industry should receive a significant portion of the value of the spectrum repurposed by ISED for 5G. As between the C-band satellite operators, these proceeds should be divided based on those metrics indicating the significance of the Canadian services provided by each operator, as well as the efforts that operator will be required to make in order to successfully clear the band. These metrics include:

- a. the number of satellites serving Canada in the band;
- b. the number of transponders on these satellites serving earth stations in Canada;
- c. the number of earth stations in Canada that communicate with the operators' satellites; and
- d. the value of the operator's revenues from services provided in Canada to both Canadian customers and U.S. customers using C-band to communicate with Canadian earth stations.

The following survey, using publicly available information, demonstrates Intelsat's significant presence in Canada.

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<sup>3</sup> "In accordance with the schedule of Canadian commitments to the GATS-ABT protocol, foreign space stations are permitted to provide domestic, cross-border and international services": 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*, April 2015. Canada and the U.S. were also parties to the North American Free Trade Agreement ("**NAFTA**") under Chapter 11 of which the parties agreed on certain protections for their investors. Under the recently ratified Canada United States Mexico Agreement ("**CUSMA**") investments – such as Intelsat's C-band investments – continue to be protected under an investor-state dispute settlement ("**ISDS**") mechanism for a three-year transitional period during which ISDS under the original NAFTA will continue to apply for investments made prior to the entry into force of CUSMA.

Metric	Intelsat's Share	Share of All Other Operators
<b>Number of authorized C-band satellites<sup>4</sup></b>	26 satellites	22 satellites
<b>Number of available C-band transponders (36-MHZ EQUIVALENT)</b>	624 transponders	528 transponders
<b>Estimated share of earth stations (based on where they are pointed)</b>	Over 50%	Less than 50%

Intelsat recognizes that the above metrics may over represent its true share of the Canadian C-band market as this satellite capacity may indeed be used outside of Canada. Nonetheless, Intelsat estimates its overall share of the value of the repurposed C-band spectrum in Canada to be no less than 25%.

### III Impact of ISED Proposal – Clearing Complexity

24. Intelsat currently distributes its content in Canada across the entire 3700 MHz – 4200 MHz band. Repacking the distribution of video signals into a smaller band, as contemplated by the Consultation, is a highly complex and costly process that cannot be undertaken without significant operational and financial expenditures by the satellite operators. These operational and financial expenditures would include significant Canada-specific investments in the ground infrastructure necessary to ensure continuity of service to Intelsat's significant Canadian customer base.
25. The significant involvement and cooperation of C-band satellite operators is necessary in order to convert spectrum to terrestrial wireless use expeditiously while adequately protecting incumbent satellite services, including those in rural communities where alternatives to the coverage, reliability, and convenience of C-band satellite services are least likely to be available. Satellite operators with detailed knowledge of their customers' exacting reliability requirements are uniquely positioned to ensure the availability of high-quality satellite service in the portion of the C-band identified for continued use by those satellite customers, and to undertake the arduous, complex, and costly task of clearing spectrum for terrestrial 5G while ensuring they can provide uninterrupted media and data services during the transition period and beyond by protecting ongoing FSS operations from adjacent-band interference due to new terrestrial networks.
26. Satellite operators are uniquely positioned to protect their own FSS customer operations, which utilize dozens of space stations and thousands of earth stations

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<sup>4</sup> Based on List of foreign satellites approved to provide fixed-satellite services (FSS) in Canada (<https://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf02104.html>) but taking into account satellites that were deorbited or taken out of service.

in Canada, because they have direct knowledge of those operations and business requirements—including non-public, contractual terms and conditions.

27. Clearing spectrum in the lower portion of the C-band while protecting customer operations will require three components, all of which must be carefully coordinated. First, additional satellite capacity was required—including by launching new satellites—to ensure sufficient supply available in the reduced FSS frequency range to absorb the incumbent services that must be moved and to meet contractual obligations for contingency capacity in the event a transponder or a satellite suffers a failure. Satellite operators will have to determine whether the additional capacity is sufficient to serve their Canadian customers. Second, a highly detailed frequency migration plan must be mapped out and clearly communicated to all customers and their end users. This plan will result in migration, not only for services currently operating in the frequencies to be cleared for terrestrial 5G operations, but also services in the remaining FSS spectrum that may need to be consolidated to find sufficient bandwidth for larger content customers. Third, there must be a plan to define and implement the necessary technical mitigation methods that will protect all incumbent services from adjacent band-interference once terrestrial 5G services are implemented.
28. As acknowledged in the Consultation, although baseline mitigation techniques may be adequate for the majority of incumbent operations, there will be cases that require additional action to ensure service continuity. The implementation of the technical mitigation plan must also be coordinated with the frequency migration plan, as the relevant frequencies must be cleared in order to install certain equipment that will be needed to minimize interference from terrestrial operations.
29. The satellite operators have performed extensive analysis to determine how to repack the existing services operating in the lower 300 MHz of the C-band and have concluded that the only way to ensure continuity to existing services is to launch certain additional C-band satellites. These satellites will serve not only the continental U.S. (“CONUS”) but also Canada.
30. Although aligning the Canadian clearing process with the clearing process currently underway in the U.S. will achieve significant efficiencies, it is overly simplistic to assume that Canada will be able to readily meet the December 2023 accelerated clearing deadline without taking into consideration the added complexity and uniqueness of the Canadian media distribution ecosystem. The nominal clearing deadline for Canada should indeed be December 2025 rather than December 2023.
31. As ISED has also reflected in the Consultation, satellite operators will also be required to use several tools to protect FSS operations while clearing C-band spectrum. These tools include: (i) fitting C-band earth stations with band-pass filters to prevent terrestrial 5G signals in adjacent cleared spectrum from saturating low-noise block converters (“**LNBS**”); (ii) taking advantage of discrimination of earth station antenna patterns to suppress 5G signals near earth stations; (iii)



defining maximum allowable 5G in-band 20 emission levels to prevent earth station LNB saturation; (iv) specifying 5G out-of-band emission levels to prevent disruption of highly sensitive satellite signals due to direct interference from both 5G base stations and 5G user equipment; (v) installing upgraded LNBS when saturation may still occur; and (vi) relying on a defined guard band between 5G signals and adjacent satellite signals.<sup>5</sup>

#### IV Lessons from the U.S. Process

32. In the U.S., the FCC only recently concluded a lengthy process to determine an approach to the repurposing of the C-band that best serves the public interest. In so doing, it recognized i) the unique nature of the C-Band to drive global 5G leadership; ii) the critical requirement of satellite operator cooperation in clearing the band; iii) the need for speed in getting this spectrum to the U.S. mobile operators to avoid falling behind in 5G; and iv) the importance of guaranteeing that vital services currently provided using the C-band will continue operating without interruption, both during and after the transition. In our respectful opinion, these important observations hold equally for Canada.
33. After significant consultation, the FCC designed a solution that did not represent the satellite operators' first choice (which was in fact a private auction for the spectrum), but which nevertheless constituted a reasoned approach to delivering this spectrum for 5G deployment in the U.S. This process, including its outcomes, were ultimately supported by all of the key stakeholders involved, including content companies, video distributors, satellite operators and mobile operators.
34. As noted by ISED in the Consultation, the solution adopted by the FCC included an auction of 280 MHz of spectrum from 3700-3980 MHz for flexible use, as well as the establishment of a 20 MHz guard band. The FCC decided to repack FSS operations into the 4000-4200 MHz range and provided a deadline of December 5, 2025, as well as a goal for accelerated relocation of December 5, 2023. The FCC provided for accelerated relocation payments to the satellite operators in addition to the reimbursement of their relocation costs, all of which would come from payments made by new flexible use licensees in the band.
35. The payments due to incumbent satellite operators under the U.S. regime described below, reflect the fundamental fairness of compensating satellite operators not only for the costs of this ambitious repurposing undertaking – to the success of which their cooperation is indispensable – but also for the value of accelerating the clearing of the band. In Intelsat's respectful opinion, the

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<sup>5</sup> Other requirements for the successful repurposing of the band, including measures to deploy the hardware needed to protect incumbent earth station operators as well as other C-band FSS users, including programmers and broadcasters, as well as measures aimed at maximizing the amount of spectrum that could be cleared while protecting incumbent satellite operations, are discussed further in Intelsat's answers to ISED's specific questions.

cooperation of, and compensation for, all incumbent satellite operators is equally important to this parallel undertaking in Canada.

*FCC Report and Order*

36. In its March 3, 2020 Report and Order<sup>6</sup>, the FCC established both a timeline and process for repurposing the C-band spectrum in the U.S., as well as a framework for compensating incumbent satellite operators in the band.

37. In considering the timeline, the FCC agreed with commenters that the transition from existing C-band services to 5G “will be an enormous and complex task”.<sup>7</sup> It therefore adopted a relocation deadline of five years to ensure the protection of incumbent earth stations, finding that clearing of the band by December 5, 2025 would be in the public interest. It stated this transition date:

“strikes a fair and appropriate balance between bringing C-band spectrum to market and ensuring space station operators, earth station operators, and other stakeholders have the necessary time to complete this transition in a careful, fair, and cost-effective manner. This date ensures this spectrum will be made available for flexible use, while guaranteeing that vital television and radio services currently provided using the C-band will continue operating without interruption, both during and after the transition.”<sup>8</sup>

Intelsat respectfully submits that a sunset date of December 2025 would similarly be in the interests of the Canadian industry and public.

38. Notwithstanding that it found a December 2025 transition date to be in the public interest, however, the FCC provided satellite operators with an incentive to clear the band on a more accelerated timeframe. It is notable that the date proposed by ISED in the Consultation, i.e., December 2023, is consistent with this accelerated timeframe.

39. Specifically, the FCC adopted two accelerated relocation deadlines proposed by Intelsat — a Phase I deadline of December 5, 2021 and a Phase II deadline of

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<sup>6</sup> FCC Report and Order of Proposed Modification (FCC 20-22) (“Report and Order”).

<sup>7</sup> *Ibid*, para. 159.

<sup>8</sup> *Ibid*, para. 160.

December 5, 2023.<sup>9 10</sup> In so doing, the FCC found that adopting rules to provide for accelerated relocation deadlines, including financial incentives, will “promote the rapid introduction of a significant tranche of C-band spectrum by leveraging the technical and operational knowledge of space station operators, aligning their incentives to achieve a timely transition, and enabling that transition to begin as quickly as possible.” The FCC specifically acknowledged the undisputed unique position of satellite operators to quickly clear a significant portion of this band, and therefore, the fact that under this scenario, the clearing process would “begin much sooner and proceed at a more rapid pace” than if it relied on the December 5, 2025 sunset date as the sole means of incentivizing space station operators to make C-band spectrum available for flexible use.<sup>11</sup>

40. The FCC noted that much of the repurposing work must also be undertaken in the ground segment:

“[A] space station operator must coordinate with relevant earth station operators to perform any necessary system modifications, repointing, or retuning to receive transmissions that have been migrated to frequencies on new transponders or satellites, and must ensure that any incumbent earth stations currently receiving in the bottom 300 megahertz are able to continue receiving those services once they are transitioned to the upper portion of the band.”<sup>12</sup>

Similarly, regardless of work undertaken to transition the band to meet the U.S. requirements, Intelsat and other satellite operators will have to undertake significant coordination with relevant earth station operators in Canada as a specific consequence of the transition in Canada.

#### *Compensating Satellite Operators*

41. The FCC ordered two types of compensation for eligible satellite operators meeting the enormous and complex task of repurposing the C-band spectrum. First, all satellite operators that meet the December 2025 transition sunset date are entitled

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<sup>9</sup> Under these accelerated relocation deadlines, eligible space station operators will have the option to clear according to the following accelerated clearing timeline: (1) clearing 120 megahertz (3.7-3.82 GHz) by December 5, 2021 in 46 of the top 50 Partial Economic Areas, and (2) clearing the remaining 180 megahertz (3.8-3.98 GHz) by December 5, 2023. In order to meet these accelerated relocation deadlines, satellite operators were required to clear an additional 20 megahertz by the end of the clearing period to be used as a guard band to protect FSS users that will continue to operate in the upper portion of the band.

<sup>10</sup> See Report and Order, footnote 462 citing Intelsat Feb. 20, 2020 Ex Parte at 4-5 (arguing for December 2021 and 2023 accelerated relocation deadlines).

<sup>11</sup> Report and Order, para. 169.

<sup>12</sup> Ibid, para. 172.

to their reasonable relocations costs. The FCC estimated the total clearing costs as ranging from about \$3.3 billion to \$5.2 billion.<sup>13</sup>

42. In addition to recovery of their reasonable relocation costs, those satellite operators that meet the earlier Phase I and Phase II accelerated relocation deadlines are entitled to significant incentive payments, in the total amount of \$9.7 Billion.<sup>14</sup>

43. Pursuant to the FCC's *Emerging Technology* framework<sup>15</sup>, both the reasonable relocation costs and the incentive payments are to be made by the successful participants in the public auction for C-band spectrum in the U.S., in addition to any amounts to be paid for their spectrum licences won in the auction itself.

#### V. Principles for a Transitional Framework – Collaboration and Compensation

44. Through its involvement in the U.S. process for clearing the C-band, Intelsat has developed significant experience in the redeployment of C-band spectrum. This experience has demonstrated the importance of incumbents and spectrum recipients working closely together to ensure the full promise of emerging technologies in this band is realized in a manner that ensures fairness to incumbents and their existing customers. At the same time, this collaboration has expedited and streamlined the process for redeployment on a timeline and in a manner that are most advantageous to the mobile operators deploying 5G technologies in the band.

45. Intelsat is similarly willing to play a major collaborative role in clearing the Canadian C-Band in a manner that delivers the greatest benefits to Canada. We agree with ISED that the potential benefits to Canadian mobile providers and Canadians of converting the use of this spectrum are enormous. And we are willing to work in good faith to both maximize and accelerate these benefits.

46. Intelsat believes that the Canadian process for redeploying C-Band spectrum should reflect certain core principles that are proving critical to the success of the parallel redeployment of this spectrum in the U.S., and will guide success of its deployment not only in Canada, but internationally (the "**Repurposing Principles**"). The Repurposing Principles recognize:

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<sup>13</sup> Report and Order, para. 210.

<sup>14</sup> "Given the record, we find that a \$9.7 billion accelerated relocation payment is reasonable and will serve the public interest." Report and Order, para. 219.

<sup>15</sup> See Report and Order, para. 181, referring to Redevelopment of Spectrum to Encourage Innovation in the Use of New Telecommunications Technologies, ET Docket No. 92-9, First Report and Order and Third Notice of Proposed Rulemaking, 7 FCC Rcd 6886 (1992) (Emerging Technologies Order), clarified by Third Report and Order, 8 FCC Rcd 6589 (1993), modified on reconsideration, Memorandum Report and Order, 9 FCC Rcd 1943 (1994).

- a. The significant value of satellite services currently provided by Intelsat and other satellite operators to Canadians, the media distribution ecosystem, and to remote communities across Canada.
- b. The significant value of the C-band spectrum being repurposed as an enabler of next generation services – not just for 5G operators, but also for the Canadian public and the Canadian economy;
- c. The importance and value of repurposing this spectrum within a timeframe and in a manner that not only makes this spectrum available for 5G at the earliest opportunity, but also minimizes the impact on existing customers in the band;
- d. The significant role to be played and costs to be incurred by all domestic and foreign satellite operators alike – primarily, Telesat, Intelsat and SES – in clearing the band for these next generation uses;
- e. the need for equal treatment of all domestic and foreign satellite operators in a manner that recognizes the unique challenges that reallocating the C-Band for 5G creates for these satellite operators and the financial and operational impact on these operators in enabling this transition; and
- f. for both domestic and foreign C-band operators, the loss of use of the major part of the C-band, together with the significant destruction of the net present value of their long-term investments made in good faith to serve customers in the band under authorizations granted by ISED.

Based on these Repurposing Principles, Intelsat describes its conditional support for certain elements of the ISED proposal, and comments on Telesat’s proposal, below.

#### V. Summary of Intelsat’s Comments on the ISED and Telesat Proposals

47. As will be further discussed in response to ISED’s specific questions in the Consultation, Intelsat supports many features of the ISED proposals contained therein. However, Intelsat is of the view that certain important additional elements should be added to these proposals in order to ensure their consistency with the Repurposing Principles and better enable Canada to position itself for 5G global leadership. In this section of its comments, Intelsat provides an overview of its conditional support for ISED’s proposals.

48. *Amount of spectrum to be cleared.* Intelsat supports ISED’s proposal to repack C-band services into the 4000-4200 MHz frequencies, except in satellite dependent areas. This will align spectrum use in Canada with that in the U.S., both for C-band services as well as 5G mobile, thereby providing Canada with significant benefits. As noted in the Consultation, Canadians consumers benefit from economies of scale realized when spectrum being made available reflects global trends.<sup>16</sup> Intelsat also notes the efficiency of aligning spectrum use on both sides of the Canada-U.S. border, which will benefit satellite operators, mobile operators,

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<sup>16</sup> Consultation, para. 9.

and users of both services. In particular, coordination challenges to protect FSS in the U.S. that will continue to operate in the 4000-4100 MHz band will severely encumber this spectrum in Canada, further diminishing its value. Accordingly, Intelsat does not support Telesat's alternative proposal to require C-band operators to repack their C-band activities within the 4000-4100 MHz frequency band.

49. *Issuance of Flexible Use Licenses.* Intelsat takes no position regarding the appropriate regulatory mechanism for issuing flexible use licenses in the band *per se*. However, whatever licensing regime is employed must incorporate a means for compensating all domestic and foreign satellite operators, and not only Telesat. Any operator who will have undertaken the arduous task of timely clearing the spectrum for the benefit of, and transferring the value in the spectrum to, these flexible use licensees, as well as for the benefit of the Canadian public, should be compensated for this work. Should ISED determine to issue flexible use licenses to the satellite operators per Telesat's proposal, Intelsat believes it should be entitled to receive no less than a 25% share of licenses issued.
50. In the U.S. proceedings, the C-Band Alliance, representing the major C-band satellite operators, filed evidence prepared by NERA Economic Consulting and Evercore Group L.L.C. with the FCC demonstrating that the value of C-band spectrum to 5G operators was in the range of between USD \$43 and 77 Billion. This assumed 280 MHz of spectrum and U.S. population covered by C-band of 307 million.<sup>17</sup> Assuming the same 280 MHz of spectrum is auctioned in Canada, and a Canadian population covered by C-band of 33,470,818<sup>18</sup>, the value of the Canadian C-band auction would be just above one-tenth of that amount, i.e., between USD \$4.7 and 8.4 Billion, or CDN \$6.2 – 9.5 Billion, all else being equal.<sup>19</sup>
51. Assuming ISED chooses to proceed by way of public auction of these flexible use licences as proposed in the Consultation, such auction must incorporate a mechanism for compensating C-band operators. Such compensation need not increase the price at which mobile operators obtain the use of this valuable spectrum (as was the case in the U.S.), and could for example be taken out of the reserve price set by ISED for this auction or through some other mechanism for allocating a portion of the auction proceeds to compensating incumbents. In Intelsat's opinion, C-band satellite operators as an industry should receive a significant portion of these proceeds. Based on its preliminary analysis, Intelsat believes it is entitled to no less than 25% of such compensation.
52. Compensating satellite operators is within the Minister's powers under the *Radiocommunication Act*. It is also sound policy in these unique circumstances. The repurposing of the C-band is a task of unprecedented scale and complexity.

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<sup>17</sup> See letter dated January 27, 2020 from the C-band Alliance to the FCC and attachments thereto.

<sup>18</sup> Tier 1 Service Area, 2011 Population, *Service Areas for Competitive Licensing*, Issue 4, October 2015.

<sup>19</sup> This applies the October 16, 2020 daily exchange rate of the Bank of Canada, of 1.3192.

Reallocation of the band from one communications technology – fixed satellite – to a completely different form of communications – next generation terrestrial mobile – far exceeds the complexity or scale of adding mobility to frequencies previously reserved for fixed terrestrial services, for example. Moreover, given the significant value to be derived by the Canadian public from the deployment of next generation mobile services in the band, compensating satellite operators out of auction proceeds would be consistent with ISED’s *Framework for Spectrum Auctions in Canada*<sup>20</sup>.

53. Specifically, this framework follows the *2007 Spectrum Policy Framework for Canada*, under which ISED adopted a policy objective to maximize the economic and social benefits that Canadians derive from the use of the radio frequency spectrum resource, and included, among the enabling guidelines under this objective, the recognition that market forces should be relied upon to the maximum extent feasible. As such, the framework considers “the following broad conditions in determining whether an auction process will be used as the spectrum assignment mechanism:

- whether the demand for spectrum is expected to exceed the available supply; and
- whether government policy objectives can be fully met through the use of an auction.”<sup>21</sup>

Intelsat submits that each of these conditions would met through the use of an auction that would use a portion of its proceeds to compensate satellite operators in recognition of the economic and social benefits that Canadians will derive from the use of the repurposed spectrum for next generation terrestrial services.

54. In addition, Intelsat believes there are potentially significant benefits to be realized by auctioning the spectrum in the C-band at the same time as, and as part of, the same auction already planned for the 3450-3650 MHz band, rather than by delaying the auction for the C-band a further two years, as proposed by ISED in the Consultation. Specifically, this would achieve several key policy objectives:

- a. It would streamline and accelerate the ISED auction process for opening up C-band for 5G by having one simultaneous process rather than two auctions, i.e., by simultaneously licensing all spectrum to be allocated to 5G.
- b. This would enhance the efficiency of ISED’s process, with attendant cost savings to the public of conducting one auction, rather than two.
- c. Even more significantly, it would also greatly enhance the ability of the mobile operators to plan their spectrum acquisition and deployment by avoiding fragmented spectrum allocations and multiple auctions. By increasing their visibility into, and efficiency of their spectrum acquisition and deployment, this likely would permit them to place a higher value on the spectrum being auctioned.

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<sup>20</sup> Issue 3, March 2011.

<sup>21</sup> Ibid, at para. 2.

55. Intelsat notes that Telesat's proposal, which requests that ISED issue only to Telesat, in exchange for its spectrum licence(s), a flexible use licence in the band that Telesat could itself transfer to 5G mobile operators, represents an alternative methodology for securing compensation for a satellite operator's costs in clearing the spectrum and loss of use of the full 500 MHz in which it previously operated in the band, as well as the value of its investment in the band. As with ISED's proposal to issue flexible use licences by means of a public auction, Intelsat would conditionally support Telesat's proposal, provided that it is revised to meet Intelsat's technical comments, and moreover to ensure that all satellite operators – both domestic (Telesat) and foreign (Intelsat and SES) – receive compensation based on a fair schedule to be specified by ISED (via grant of flexible use licenses or through other means). Under such scenario, Intelsat believes it should be entitled to a minimum 25% of compensation granted to satellite operators.
56. Telesat cites previous transitions, such as WS-4, 600 MHz, 700 MHz, 2500 MHz and 3500 MHz bands where ISED provided incumbents with alternative spectrum rights and transitional bands to mitigate the impact of the reallocations on providers and users.<sup>22</sup> However, in those instances the licences or authorizations exchanged granted exclusive use of the frequencies in question. In its proposal, Telesat argues that it is “the only space station spectrum licensee in the 3700-43200 MHz band providing commercial FSS services.”<sup>23</sup> However, Telesat is not the exclusive user of the band, as foreign satellite operators, such as Intelsat and SES have long been authorized by ISED to provide services in Canada using the same frequencies, and are providing services to Canadians on such frequencies in competition with Telesat. Accordingly, any framework for exchanging C-band licences or authorizations for marketable flexible use licences must take into account other satellite operators in the band in a manner that reflects their share of the C-band FSS ecosystem in Canada and the degree to which Canadians rely on their services directly or indirectly.<sup>24</sup>
57. Regardless of the form such compensation takes (i.e., payment out of auction proceeds or through marketable flexible use licences), it must extend to foreign satellite operators, and not solely to Telesat. This non-discriminatory treatment would not only be consistent with the FCC's treatment of all C-band operators (Telesat was given equal treatment to U.S.-based C-band operators under the Report and Order) but also with Canada's international trade commitments, which

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<sup>22</sup> Telesat Proposal, Annex H to Consultation, at para. 32. Intelsat notes as well that these instances did not all involve exchanges of spectrum licences for flexible use licences. For example, the MDS authorizations exchanged for BRS licences under Notice No. DGTP-002-06 — *Policy Provisions for the Band 2500-2690 MHz to Facilitate Future Mobile Service* largely consisted of Broadcasting Certificates, rather than spectrum licences *per se*.

<sup>23</sup> Telesat Proposal, para. 33.

<sup>24</sup> Any concern for exchanging C-band authorizations for multiple flexible use licences suggests that compensating C-band operators out of the proceeds generated by a public auction may be the better route in this unique case.



include commitments to grant national treatment to satellite operators of signatories.

58. Moreover, contrary to the impression that may be conveyed by Telesat's statement that "only Telesat, as Canada's sole FSS satellite licensee in the C-band, has the ability to successfully lead and execute this transition"<sup>25</sup>, Telesat cannot accomplish the clearing of the C-band alone, without loss of existing services to Canadians. The Telesat proposal, as written, fails to account for the indispensable role that satellite operators such as Intelsat, which have a significant role and presence in the Canadian market must play in any successful clearing of the portion of the band repurposed for 5G. As described above, clearing the band will necessitate all satellite operators that serve Canada working closely with their customers in the band. Therefore, in fact, Telesat cannot do it alone. As a matter of policy, too, Telesat, which competes directly with Intelsat and SES – should not be permitted to engage with the customers of other satellite operators. Therefore, as recognized in the Consultation, any solution to clearing the band must involve all satellite operators authorized by ISED to operate in the band and that provide services to Canada.

59. *Timeline for Clearing.* Absent a framework for compensating clearing efforts, it is reasonable to anticipate that the arduous effort of clearing the band in Canada will take satellite operators until at least December 2025. This is the same date determined by the FCC to be in the public interest, given the enormity and complexity of the task.

60. Assuming the Repurposing Principles articulated above are observed, however, Intelsat is willing to undertake the financial and operational expenditures necessary to clear 200 MHz of its customers/users for delivery to the mobile providers as early as possible. In order to meet an accelerated timeframe, a complex process of planning and lining up of resources has to be set in motion as early as possible. Therefore, Intelsat will require a minimum of up to 21 months following an ISED decision in order to clear the first 200 MHz, with the balance being cleared by December 2023 – an even more accelerated timeline than that proposed by ISED, and one that will add significant value to Canada's 5G competitiveness. Specifically, under Intelsat's proposal the timeline for clearing the bottom 300 MHz in the band (including a guard band between 3980 and 4000 MHz), would be accelerated significantly:

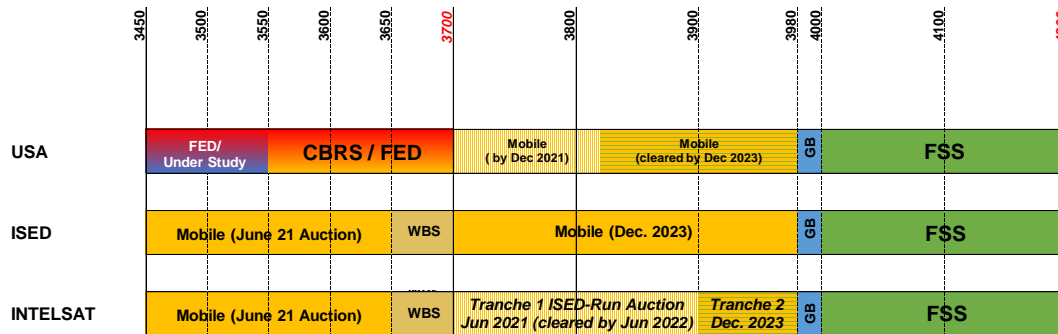
- a. 3700-3900 MHz would be cleared in non-satellite dependent areas<sup>26</sup> in Canada ahead of ISED's originally proposed timeline, i.e., within 21 months of an ISED decision; and,
- b. 3900-4000 MHz would be cleared by Dec. 2023.

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<sup>25</sup> Telesat Proposal, para. 40.

<sup>26</sup> Intelsat will have to gain a better understanding of the scope of non-satellite dependent areas.

The proposed timeframe would enable Canada to put this 5G spectrum in the hands of Canadian mobile operators in a timeframe similar to and even earlier than in the U.S. - enabling Canada to position itself for 5G global leadership. This would meet the policy objectives outlined by ISED in the Consultation, including, most prominently, the objective under the *Spectrum Policy Framework for Canada*, which states, “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.”<sup>27</sup>



## VI Intelsat Responses to Specific Questions in the Consultation

In the balance of these comments, Intelsat has endeavoured to answer specific questions asked by ISED in the Consultation. Where the answer cross-references a portion of the above text, it should be considered to incorporate the text so identified. Failure to answer any specific question should not be taken as an admission by Intelsat and Intelsat reserves its right to reply to any comments submitted by another party in accordance with the process set out in the Consultation for reply comments.

**Q3:** ISED is seeking comments on how the difference in technical rules between the U.S. and EU could impact Canada’s ability to leverage the economies of scale from the global 3800 MHz ecosystem. In particular:

- a) would the difference in technical rules (such as out-of-band-emission (OOBE) power limits) result in two distinct region-specific equipment ecosystems
- b) which equipment ecosystem would be more suitable in the Canadian environment (noting that Canada has, for the most part, aligned with the U.S. on low- and high-band spectrum for 5G but in the mid-band, Canada is more aligned with the EU in the 3500 MHz band (3450-3650 MHz)) and specifically, whether Canada should generally align its technical rules with the U.S. or the EU in the 3800 MHz band

<sup>27</sup> Consultation, para. 10.

In providing comments, respondents are requested to include supporting arguments and rationale.

The benefits of economy of scale for the global 3800 MHz ecosystem comes predominantly from the mobile stations (e.g., handsets) rather than the in-country infrastructure (base stations). The number of 5G base stations that will be deployed is a very small fraction of the number of mobile stations that will operate with these base stations.

The OOB power limits are a critical element to protecting FSS earth stations from interference. The FCC adopted a base station and mobile station OOB power limit of -13 dBm/MHz as well as an OOB threshold of -124 dBW/m<sup>2</sup>/MHz) at the input of the earth station antenna.<sup>28</sup> The latter requirement requires that flexible use operators meet the OOB threshold in spite of the allowed OOB power levels and know the location of all FSS earth stations. Intelsat proposed lower base station emission levels in order to provide greater deployment flexibility and reduce the risk of interference into FSS earth stations.

Intelsat proposes that ISED adopt the more stringent OOB power limits adopted by the EU for base stations operating in Canada. These limits will not overly constrain flexible use operations or have a significant impact the economy of scale benefits in the equipment ecosystems. Moreover, this would facilitate deployment of FSS earth stations in areas as envisioned by the ISED consultation.

**Q4:** ISED is seeking comments on the proposal to add a primary mobile service, except aeronautical mobile, allocation in the 3700-4000 MHz band to the CTFA and the specific changes shown in annex B.

In providing comments, respondents are requested to include supporting arguments and rationale.

Intelsat supports ISED's proposal that would establish the appropriate allocations in the 3700-4000 MHz band for the flexible use proposed by ISED. This action will align the CTFA with the ITU Table of frequency allocations and allow future mobile operations in Canada to operate on a primary basis.

**Q5:** ISED is seeking comments on developing a flexible use licensing model for fixed and mobile services in the 3650-4000 MHz band.

In providing comments, respondents are requested to include supporting arguments and rationale.

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<sup>28</sup> Report and Order, paras, 305-312.

As set out above in paragraph 49 above, Intelsat takes no position regarding the appropriate regulatory mechanism for issuing flexible use licenses in the band *per se*. However, for the reasons cited above, whatever licensing regime is employed must incorporate a means for compensating all satellite operators – both domestic and foreign – who have undertaken the arduous task of clearing the spectrum for the benefit of, and transferring the value in the spectrum to, these flexible use licensees, as well as for the benefit of the Canadian public

Intelsat incorporates and relies on paragraphs 49 to 57 above into its response to this question.

#### **Harmonization of FSS use**

**Q6:** Given the proposal in section 7.2 on developing a flexible use licensing model for fixed and mobile services in the 3650-4000 MHz band, ISED is seeking comments on the proposal that no new FSS earth stations be authorized in the 3700-4000 MHz band in the future and that the authorization of new FSS earth station licences be limited to the 4000-4200 MHz band.

Intelsat disagrees with the proposal that no new FSS earth stations be authorized in the 3700-4000 MHz band. The deployment of terrestrial services in these bands is likely to be concentrated in populated areas, with little or no deployment, in other, more rural areas. Instead of an all-out ban on future FSS earth station deployment Intelsat proposes that FSS earth station should be authorized in the 3700-4000 MHz band with a condition to coordinate and/or reach a commercial agreement with the flexible use licensee in that area. If an FSS earth station operator cannot reach agreement the flexible use licensee then the FSS earth station can be deployed on an unprotected basis. This approach will not pose any risk of interference to the flexible use operator because the FSS earth station is only receiving in this band.

This approach is consistent with ISED's recognition in the Consultation that through "coordination and mitigation measures, co-frequency sharing could still be achieved in some areas".<sup>29</sup> Intelsat does not expect that co-frequency sharing will be feasible everywhere but having this option will ensure that the spectrum is used most efficiently.

#### **Guard band between flexible use and FSS**

**Q7:** ISED is seeking comments on the proposal to implement a 20 MHz guard band between 3980-4000 MHz to protect FSS operations in 4000-4200 MHz band from proposed flexible use operations in the 3700-3980 MHz band.

Intelsat supports the 20 MHz guard band proposed by ISED; however, this is only one part of the technical requirements for 5G and FSS co-existence and it is necessary for

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<sup>29</sup> Consultation, para. 60.

ISED to consider additional technical measures including OOB and IBE thresholds at the earth station antenna.

Intelsat supported the adoption of a 20 MHz guard band between 3980-4000 MHz in the FCC proceeding. It is critical for ISED to recognize that the guard band size is one element of an integrated technical solution that cannot be separated from the other technical measures needed to protect FSS.

A fundamental trade-off exists between the frequency response of the bandpass filter and the required guard band between 5G and FSS operations. A large guard band, 50-200 MHz, results in lower insertion loss and simpler filter design, while a narrower guard band, 5-15 MHz, requires a filter that is physically heavy and too cumbersome to fit between the antenna and the LNA/LNBs. Through the FCC proceeding it was agreed that a 20 MHz guard band strikes a good balance between efficient spectrum usage and acceptable and realizable filter performance.

Intelsat was the first to recognize that more than 60 dB rejection is required in the stopband for FSS to seamlessly co-exist with adjacent 5G and prevent LNA/LNB saturation. After extensive simulation, modeling and measurements Intelsat was the first company to design, build, and test a 5G bandpass filter with 60 dB rejection within a 20 MHz guard-band. Intelsat has successfully demonstrated this bandpass filter performance with live satellite signals in the presence of 5G interference. Therefore, a 60 dB rejection bandpass filter can be achieved at 20 MHz from the edge of the FSS band, which exhibits good performance for the insertion loss, return loss, and group delay as well as reasonable weight and form-factor that can be inserted between the antenna and the LNA/LNB.

Intelsat supports the 20 MHz guard band proposed by ISED but reiterates that this is only one part of the technical requirements for 5G and FSS co-existence and it is necessary for ISED to consider additional technical measures including OOB and IBE thresholds at the earth station antenna.

#### **Maintaining FSS services in satellite-dependent areas**

**Q8:** ISED is seeking comments on the proposal to maintain a primary allocation to FSS in the entire 3700-4200 MHz band and the proposal that existing FSS earth stations in satellite-dependent areas remain licensed in the entire 3700-4200 MHz band.

Intelsat supports ISED's proposal to maintain the FSS primary allocation across the 3700-4200 MHz band. This will allow continued FSS operations in satellite dependent areas while also providing ISED flexibility, as necessary, to allow FSS use to meet specific requirements that cannot be met with the terrestrial flexible use systems in other areas. For example, ISED recognizes that C-band FSS are used to provide connectivity to

industry operations that may not be fully located within satellite dependent areas.<sup>30</sup> Any conditions necessary to limit FSS use can be specified in footnotes to the allocation.

**Q9:** ISED is seeking comments on the future demand for C-band in rural and remote areas such as the North, including the following:

- a) the trend towards using higher frequencies by FSS operations to provide broadband connectivity
- b) the ability of using higher frequencies to replace current C-band capacity and the potential timelines
- c) the possibility of a trend towards using 4000-4200 MHz in combination with other connectivity options (e.g. higher frequencies satellites or wireline solutions) and when it would be expected to be available for satellite-dependent areas

- a.) As the world's largest provider of C-band FSS services globally, Intelsat has witnessed how those services have evolved over time. While there is marked shift towards higher frequencies for consumer broadband services, Intelsat sees a sustained demand for C-band – albeit more concentrated – for critical services that require higher reliability and availability. For example, C-band is used for trunking applications in support of broadband services (B2B), but not as a service provided directly to consumers (B2C). It also must be noted that C-band continues to be the medium of choice for distributing broadcast content at a regional and global level due to its unsurpassed reliability and quality.
- b.) Higher frequencies such as Ka or Ku bands have the distinct advantage of allowing the use of smaller user terminals, which make them better suited for B2C services or B2B services that do not have stringent availability requirements. However, for critical cases that require high availability, or for applications that require broader continental coverage, C-band remains the medium of choice due to unparalleled propagation characteristics and its resilience to rain fade C-band. In contrast, higher frequency spectrum is susceptible to rain fade and is not suitable for continental coverage. Thus, services that rely on C-band – such as video distribution – cannot be easily replicated in other frequency bands, or via terrestrial means. See also, paragraphs 19, 20 and 21 above.
- c.) Canada has one of the best telecommunications infrastructures in the world. As the network continues to cover more regions in this vast country, reliance on C-band as the only mean of communications in the satellite dependent areas would decrease. Nonetheless, there will always be a sustained need for some C-band services in the 4000-4200 MHz band to provide the added the resilience and ensure a certain level for quality of service.

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<sup>30</sup> Consultation, para. 120.

Currently Intelsat has satellites that provide C-band service to Canada and these services include video/audio distribution, enterprise networks and government operations.

**Q11:** ISED is seeking comments on its proposal to remove the FSS allocation in the 3500-3650 MHz band and to suppress Canadian footnote C20 in the CTFA as detailed in annex B. In addition, ISED is seeking comments on the proposed grandfathering of the existing earth station operations listed in annex C, such that fixed or mobile stations in the 3500-3650 MHz band will be required to coordinate with these earth stations as specified in SRSP-520.

In providing comments, respondents are requested to include supporting rationale and arguments.

Intelsat does not support suppressing the FSS allocation in the 3500-3560 MHz band. Operational satellites provide services in portions of this band including maritime services that can operate without constraining the implementation of fixed wireless access and terrestrial mobile systems consistent with footnote C20. An alternative would be to modify footnote C20 to indicate that FSS earth stations, except for the grandfathered earth stations, will operate on a non-protected basis with respect to mobile operations.

**Q12:** ISED is seeking comments on its proposal to remove the primary FSS allocation from 3650-3700 MHz and suppress Canadian footnote C33 in the CTFA as detailed in annex B.

In providing comments, respondents are requested to include supporting rationale and arguments.

Intelsat does not support removing the FSS allocation from 3650-3700 MHz or suppressing footnote C33. Intelsat does provide services in this band to some locations in Canada, albeit outside of major population centers. As ISED notes, the footnote specifies that FSS operations be permitted on a secondary basis and limits FSS use to large earth station antennae types in remote areas outside urban centres. As discussed in our response to Question 6 above, ISED should establish a framework that promotes the most efficient use of spectrum and allow operations on a secondary basis, especially in cases where the primary user will not be subject to any potential interference. This is the case for FSS downlink use of the 3650-3700 MHz frequency band.

**Q14:** Subsequent to changes to the spectrum utilization described in section 7 and recognizing the need to change the current WBS licensing model, ISED is seeking comments on its proposal to displace the existing WBS licensees and designate 80 MHz of spectrum available for the development of a new shared licensing process in the 3900-3980 MHz band as described in Option 2. Specifically, ISED is seeking comments on:

- a) the amount of spectrum proposed (80 MHz) under a shared spectrum licensing process
- b) whether there should be a provision that allows certain users (e.g. existing WBS licensees) priority licensing (e.g. an initial application window before accepting applications from others)

Preliminary comments on a future shared spectrum licensing process are being sought in section 9.1.4 below.

As a threshold matter, ISED needs to ensure that any new services that operate in the 3900-3980 MHz band are operated in such a manner that protects FSS operations in the 4000-4200 MHz band in non-satellite dependent areas and in the 3700-4200 MHz band in satellite dependent areas. ISED is relying on FCC rules to protect FSS in adjacent bands that were based on terrestrial flexible use operations. If other types of services are allowed to operate in the band, ISED will need to ensure that adjacent FSS operations are protected.

Under the ISED proposal, WBS will have access to 80 MHz of spectrum compared to the current 50 MHz in the 3650-3700 MHz band. Another option would be to allow WBS to operate in the 3450-3530 MHz band. This will allow flexible use licensees to fully access 280 MHz in the 3700-3980 MHz band. As compared to the 3450-3650 MHz band, which is currently occupied by numerous Fixed Wireless Access (FWA) operators, this band will be completely unencumbered.. FWA may be a lessor encumbrance to WBS than to Flexible Use Licensees. As stated above, any type of operations in the 3900-3980 MHz band will need to protect adjacent FSS operations.

**Q16:** Based on the proposal to implement Option 2, ISED is seeking comments on the proposed displacement deadlines, with WBS operations in urban areas being displaced by December 2023 and all others by December 2025. Respondents are invited to propose other protection and displacement options for consideration, provided they include a strong rationale.

Intelsat believes that there is far greater complexity and cost associated with satellite clearing than clearing WBS. Accordingly, as a matter of principle, it seems incongruous that ISED is proposing to afford WBS operators five years (to December 2025) to completely clear out of its currently allocated band of 50 MHz in all territories, while FSS services are expected to complete clearing of 300 MHz in three years, by December 2023. While Intelsat has no strong views on the amount of spectrum to be licensed for WBS, Intelsat believes that the ideal spectrum for WBS would be at 3450-3530 MHz. This leads to better alignment with the U.S. band plan, which will be especially critical in the border areas. The 3450-3530 MHz band is currently allocated to federal use in the U.S., but plans are underway to open up this band to shared access by non-federal users, possibly under a scheme similar to Citizens Band Radio Service (“**CBRS**”). Therefore, placing WBS at the lower end of the band may be more conducive to easier border coordination.



**Q19:** ISED is seeking preliminary comments on the future spectrum licensing process for 3900-3980 MHz, including the following:

- a) what type of applications are envisioned for this spectrum
- b) what type of shared licensing process ISED should consider (e.g. database approach, licensee to licensee coordination)
- c) what additional measures ISED should consider employing to manage access to the band in high demand areas, such as major metropolitan centres
- d) what technical restrictions should be considered (e.g. technical rules similar to adjacent 3500 MHz flexible use band with reduced power levels, a guard band between new flexible use systems below 3900 MHz, shared use above 3900 MHz, etc.)
- e) what type of eligibility criteria, if any, should be established

In providing comments, respondents are requested to include supporting rationale and arguments.

Intelsat believes that ISED should adopt a technology-neutral approach to licensing in this band. For example, the use of High Altitude Platforms (HAPs) should not be excluded from this band. The HAPs platform can be used to provide FWA-type services in a very cost-effective manner, or can also be used to support traditional mobile deployment in areas where ground infrastructure (i.e., towers and fibre) may be cost-prohibitive.

**Q20:** ISED is seeking comments on its proposal that existing FSS earth stations licensed in 3650-3700 MHz after June 11, 2009, be permitted to continue to operate on a no-protection basis with respect to proposed new flexible use operations.

In providing comments, respondents are requested to include supporting rationale and arguments.

As addressed in responses to questions 6 and 12, Intelsat supports permitting existing FSS earth stations, as well as new FSS earth stations, to operate on a non-protection basis with respect to the proposed flexible use operations.

**Q22:** ISED is seeking comments on whether certain remote industry operations, for example offshore oil drilling platforms, should be included in the definition of satellite-dependent areas.

In providing comments, respondents are requested to include supporting rationale and arguments

As recognized by ISED, reliance on C-band FSS is not limited to low population areas and remote communities. ISED should therefore ensure that industry operations, such as mining operations and off-shore drilling platforms, are encompassed in the areas defined as satellite dependent so that these industries can continue to benefit from these services. In any case, these sites are often in very remote locations and quite far from urban centres, so it is not anticipated that including these sites in the definition of satellite-dependent areas will result in any encumbrance to flexible use licensees.

**Q23:** ISED is seeking comments on its proposal to modify the existing FSS satellite authorizations to limit FSS operations in 3700-4000 MHz in non-satellite-dependent areas of Canada to a no-interference basis. ISED is also seeking comments on the proposal to adjust the conditions of licence for FSS operations to reflect the proposals as of the FSS transition deadline, including the possible removal of a high expectation of renewal for the 3700-4000 MHz portion of the band.

Intelsat supports the ISED proposal, that after the transition date, FSS operations in the 3700-4000 MHz band in non-satellite dependent areas will be on a non-interference basis and that in satellite-dependent areas operations in the 3700-4200 MHz maintain primary status. ISED should not constrain the ability of FSS operators to coordinate protection with flexible use licensees. ISED should ensure that Canadian-licensed and foreign - licensed satellites are treated equally on the above conditions. Intelsat agrees that appropriate updates on the condition for license should be made.

**Q24:** ISED is seeking comments on its proposed date of December 2023 as the Canadian FSS transition deadline.

Intelsat believes that the nominal transition deadline should be set to December 2025. The December 2023 FSS transition deadline for Canada coincides with the incentivized accelerated relocation deadline in the U.S. Meeting this accelerated relocation deadline in the U.S. involves a major undertaking by the satellite operators, not only with respect to the procurement of seven additional satellites by Intelsat alone, but it also involved extensive planning for the ground segment which involves deploying high efficiency video compression equipment, new earth stations, and filters. When satellite operators agreed to this accelerated clearing deadline in the U.S., it was done after two years of planning and within a framework that incentivized collaboration among all stakeholders. These plans did not include or account for a simultaneous Canadian transition. Therefore, it is unreasonable to assume that Canada will also be able to meet the accelerated clearing deadline of December 2023 without fully taking into account the complexity of the process, the unique challenges of the Canadian market, and any construct that would compensate the satellite operators. Nonetheless, under a construct that meets Intelsat's Repurposing Principles, including fairly compensating satellite operators, Intelsat is willing to support an accelerated clearing as outlined in Paragraph 60.

It must be noted that our guiding principles in any transition, referred to above as the Repurposing Principles, include ensuring that the services we provide to our customers

must continue, now and into the future, without interruption or degradation. This principle is not achievable within the framework proposed by ISED and accordingly, our preliminary view is that the proposed FSS transition deadline of December 2023 for Canada is not achievable unless certain revisions to the framework, outlined above at paragraphs numbered 45 to 51 are made to ISED's proposal.

**Q25:** ISED is seeking comments on how the U.S. transition will impact the availability of FSS capacity in Canada.

In providing comments, respondents are requested to include supporting rationale and arguments.

Intelsat believes that the proposed date of December 2023 as the Canadian FSS transition deadline is not achievable without further analysis and without framework that incentivizes all stakeholders to cooperate.

The guiding principle for Intelsat, first and foremost, is to ensure service continuity to its customers at equal or better quality, now and into the future. The December 2023 deadline proposed by ISED coincides with the incentivized accelerated relocation deadline that was set by the FCC in its Report and Order, and to which Intelsat and other satellite operators agreed. As such, the satellite operators who opted to participate in the incentivized accelerated clearing plan in the U.S. have developed extensive plans to meet this deadline for their U.S. customers. These plans are quite extensive and involve launching satellites, traffic grooming, ground infrastructure upgrades, adding and upgrading earth stations, etc. This planning and work did not proceed on the assumption that Canada would mandate clearing of FSS operations in the 3700-4000 MHz band at the same time.

The U.S. process started in earnest in the summer of 2017, and took over two years of fleet analysis, rigorous technical analysis, working with customers, and gathering information about earth station operators, among other activities.

**Q26:** ISED is requesting information to assist with the consequent decision following this consultation. This information includes satellite transponder migration plans, frequencies, and how satellite operators serving the Canadian market will accommodate all Canadian customers, and on which frequencies. Requested information could include, but is not limited to:

- the names and number of satellites that will need to migrate to the 4000-4200 MHz band
- the number of new satellites that may be required to serve the Canadian market
- the locations of earth stations communicating with these satellites
- the number of antennas and locations of associated earth stations that will need to be retuned and/or repointed

- the flexibility of existing satellites to modify operations according to the different areas of Canada

This information should be submitted on a confidential basis, as instructed in section 13.

The information requested is quite complex and requires thorough and detailed analysis by the satellite operators. Intelsat therefore requests additional time to be able to provide ISED with an accurate and comprehensive response to this question.

**Q27:** ISED is seeking comments on its proposed transition deadline of December 2023 for FSS earth stations, in which existing FSS earth station licences would be modified to 4000-4200 MHz in the relevant areas.

As set out above in paragraph 59, assuming the Repurposing Principles articulated above are observed, Intelsat is willing to undertake the financial and operational expenditures to clear 200 MHz of its customers/users for delivery to the mobile providers within 21 months of ISED making its decision in this Consultation, with the balance by December 2023. Specifically, under Intelsat's proposal the timeline for clearing the bottom 300 MHz in the band (including a guard band between 3980 and 4000 MHz, would be accelerated significantly:

- a. 3700-3900 MHz would be cleared in non-satellite dependent areas in Canada ahead of ISED's originally proposed timeline, i.e., within 21 months of ISED making its decision; and
- b. 3900-4000 MHz would be cleared by Dec. 2023.

Intelsat incorporates and relies on paragraphs 37 to 46 above into its response to this question.

**Q28:** ISED is seeking comments on making amendments to the relevant conditions of licence and technical rules in the 3700-4200 MHz band as well as the 3450-3700 MHz band in order to implement the following proposals with respect to protection from interference:

- a) **prior to the transition deadline**, existing licensed FSS earth stations may operate in the entire 3700-4200 MHz band in **all areas** and be protected from interference from flexible use operations both in-band (3700-3980 MHz) and the adjacent 3450-3700 MHz band
- b) **after the transition deadline**, existing licensed FSS earth stations may continue to operate in the entire 3700-4200 MHz band in **satellite-dependent areas** and be protected from interference from in-band flexible use operations in 3700-3980 MHz, but would not be protected from flexible use operations in the adjacent 3450-3700

MHz band; however, ISED also proposes that flexible use licensees deploying stations in the 3450-3700 MHz band within 25 km of an existing licensed FSS earth station in the 3700-4200 MHz band be required to provide a notification to these operators, one year prior to the deployment of fixed or mobile stations

- c) **after the transition deadline**, FSS earth stations would only be licensed to operate in the 4000-4200 MHz band in **non-satellite-dependent areas** and would be protected from flexible use operations in the adjacent 3700-3980 MHz band
- d) **after the transition deadline**, FSS earth stations operating in 3700-4000 MHz, in all areas, which are not eligible for licensing could continue to operate as a licence-exempt station without protection from flexible use operations both in-band and adjacent band(s)

a) Intelsat agrees that prior to the transition date FSS earth stations can operate in the 3700-4200 MHz band across Canada on a protected basis from both in-band and adjacent band flexible use operations. ISED should ensure that the right measures are in place and that conditions are placed on any flexible use licenses to clearly indicate the above.

b) Intelsat does not agree with ISED's proposal that would allow interference from flexible use terrestrial services operating below 3700 MHz to primary FSS earth station operating in the 3700-4200 MHz in satellite-dependent areas. In order to protect the critical C-band satellite services in satellite dependent areas ISED should require not only notification of operations of flexible use operations in the 3450-3700 MHz but coordination with FSS earth stations within 25 km of the flexible use stations. Intelsat further supports protection of FSS services in the 3700-4200 MHz band from in-band flexible use operations in the 3700-3980 MHz as proposed by ISED.

c) and d) Intelsat agrees that, after the transition deadline, FSS earth stations in non-satellite dependent areas would only be licensed in the 4000-4200 MHz band. These licensed FSS earth stations would be entitled to protection from flexible-use operations in the 3700-3980 MHz band. Any FSS operations in the 3700-4000 MHz band in non-satellite dependent areas would operate on a non-protected basis vis-a-vis flexible use operations.

**Q29:** ISED is seeking comments on the proposed change to the CTFA to add the new footnote CZZ proposed above and shown in annex B.

Intelsat supports the ISED proposal to add new footnote CZZ to the CTFA.

**Q30:** ISED is seeking comments on how to ensure the continued operation of gateways that support the provision of services in satellite-dependent areas, specifically:

- a) how much spectrum would be required at these gateway sites

b) if these stations could be consolidated into two sites, away from major population centres, and where the best locations for those sites would be.

In providing comments, respondents are requested to include supporting rationale and arguments.

Intelsat encourages ISED to establish sites where gateways can be deployed to support satellite services. The specific number of gateway sites and locations, as well as spectrum requirements require further examination.

**Q31:** ISED is seeking comments on its proposal to issue interim authorizations for certain existing licence-exempt earth stations in the 3700-4200 MHz band.

Intelsat does not oppose ISED's proposal to issue interim authorizations for certain existing license-exempt earth stations.

**Q32:** ISED is seeking comments on the proposed deadline of up to 90 days after the publication of a decision for submitting applications for these interim authorizations of existing licence-exempt FSS earth stations in the 3700-4200 MHz band.

Intelsat is not opposed to the 90-day time period.

**Q33:** ISED is seeking comments on its proposal that receive-only earth stations that are not eligible for an interim authorization or whose operators do not seek authorization, could continue to operate as a licence-exempt earth station on a no-protection basis.

Intelsat agrees with the ISED proposal that receive-only earth station that do not receive an interim authorization should be allowed to continue to operate on a non-protected basis.

**Q34:** ISED is seeking comments on its proposal that in non-satellite-dependent areas, existing earth stations that operate under interim authorizations receive in-band protection from flexible use operations in the 3700-3980 MHz band until the transition deadline.

Intelsat agrees with this proposal.

**Q35:** ISED is seeking comments on its proposal that in satellite-dependent areas, existing earth stations that operate under an interim authorization receive in-band

protection from flexible use operations in the 3700-3980 MHz band before and after the transition deadline.

Intelsat agrees with this proposal.

**Q36:** ISED is seeking comments on its proposal that in all areas, existing licence-exempt earth stations that operate under an interim authorization receive no protection from adjacent band WBS stations and flexible use stations operating below 3700 MHz before and after the transition deadline.

Intelsat does not agree that in satellite dependent areas earth stations should not receive protection from WBS and flexible use stations operating below 3700 MHz. In this Consultation, there is an ISED proposal to move WBS operations to another portion of the C-band so it is not yet clear what stations will be operating below the 3700 MHz band. Nevertheless, as stated in our response under Question 28, it is important that ISED protect the critical C-band satellite services in satellite dependent areas after the transition deadline and that ISED require not only notification of operations of flexible use operations in the 3450-3700 MHz but coordination with FSS earth stations within 25 km of the flexible use stations.

**Q37:** ISED is seeking comments on whether the interim authorization process should also apply to new receive-only FSS earth stations in the 4000-4200 MHz band.

Intelsat does not object to use of the proposed interim authorization process for new earth stations in the 4000-4200 MHz with the understanding that these earth stations will be protected from flexible use operations in adjacent bands.

**Q38:** ISED is seeking comments on the proposed conditions for interim authorizations for licence-exempt FSS earth stations in 3700-4200 MHz and new receive-only FSS earth stations in the 4000-4200 MHz portion of the band as detailed in annex G.

Intelsat does not object to the conditions for interim authorization outlined in Annex G but may have comments regarding the details of the future decision paper when available.

**Q39:** ISED is seeking comments on the proposed eligibility of licence-exempt stations that could apply for an interim authorization.

In providing comments, respondents are requested to include supporting rationale and arguments.

Intelsat does not have concerns regarding the proposed eligibility.

**Q40:** ISED is seeking comments on its proposal to no longer issue new licences for fixed services to operate fixed point-to-point applications in the 3700-4000 MHz band.

Intelsat agrees with the ISED proposal.

**Q41:** ISED is seeking comments on whether to allow new licences for fixed services to operate fixed point-to-point applications in the 4000-4200 MHz band.

Given the limited number of fixed service licenses in the 3700-4200 MHz band currently deployed and that there is no indication that the FS requirements are growing in this band Intelsat proposes that the current fixed systems in operation be grandfathered and that ISED not issue new fixed licenses in the 4000-4200 MHz band. Although FS point-to-point and FSS earth station typically coordinate operations the increased intensity of FSS use, as a result of compressing FSS operations into 200 MHz of spectrum, does not have to be further complicated by additional FS operations, especially given the lack of interest in deploying FS stations in these bands.

#### **Adjacent band**

**Q46: Until the transition deadline, in all areas for flexible use in the 3650-3700 MHz band:** ISED is seeking comments on the proposal that until the transition deadline, those flexible use licensees deploying stations in 3650-3700 MHz within 25 km of a licensed FSS earth station (not including interim FSS authorization) in the 3700-4200 MHz band will be required to coordinate with the operators in these earth stations.

Intelsat agrees that prior to the transition deadline, flexible use in the 3650-3700 MHz should be required to coordinate with licensed FSS earth stations within 25 km. Additionally, coordination should be required with all earth stations, including earth stations operating under interim FSS authorizations.

**Q47: After the transition deadline, in all areas for flexible use in the 3450-3650 MHz band:** ISED is seeking comments on its proposal that the current SRSP-520 coexistence requirements for flexible use operations in the 3450-3650 MHz band to protect FSS operations in the adjacent band 3700-4200 MHz be removed.



Intelsat believes that the current coexistence requirements for protecting FSS operations should be maintained for FSS earth stations in satellite dependent areas. Therefore, the SRSP-520 requirements should be retained for earth stations in these designated areas.

**Q48: For FSS earth stations licensed in the 4000-4200 MHz band and flexible use in the 3800 MHz band, in all areas:** ISED is seeking comments on adjacent band coexistence measures, taking into account the coexistence measures adopted by the EU (i.e. a stringent OOB limit) and the U.S. (i.e. a combination of guard band, a typical OOB limit, pfd limits, and baseline minimum filter specifications for earth station operations) and the current Canadian requirements (i.e. a typical OOB limit and coordination distance):

- a) What are the benefits and technical limitations associated with the above coexistence measures?
- b) Which set of coexistence measures above (i.e. EU, U.S., Canada) is preferred? If applicable, comments are sought on the values of the limits in relation to the supported measures.
- c) Given the proposal in section 9.1 to displace WBS in 3650-3700 MHz and identify 3900-3980 MHz for shared use, are there any additional considerations that may impact the response to a) and b) above?
- d) Which portion of the 3800 MHz band should the above measures be applied to in order to protect FSS in the 4000-4200 MHz band (i.e. how many frequency blocks or MHz)?

The FCC decision combined several technical measures for coexistence between flexible terrestrial use and FSS receive earth station operations. This approach balanced several competing requirements and its success lies in the necessity to take all the measures into account rather than just picking several out of the mix. For example, as explained above in response to Question 7, the guard band is a part of a set of technical measures but cannot be dissociated from the bandpass filter characteristics. A bandpass filter can be built with 60 dB rejection at 20 MHz from the edge of the FSS band. Lack of a bandpass filter or a bandpass filter with lower stopband rejection performance results in the need for a large separation distance between 5G and FSS earth stations, as large as 1km or more. The benefit of a minimum baseline filter specification for earth station operations is that it avoids gaps in the service areas for 5G operation that would exist if large separation distances were required. In contrast with the simpler Canadian approach, the FCC framework, albeit more complex, results in less coordination between flexible use licensees and earth station operators and will streamline 5G deployment.

The FCC has adopted typical OOB power limits for the base stations and user equipment, similar to ISED's proposal. However, in the FCC rules the additional flexibility of higher OOB power limits, compared with those adopted by the EU, comes with the requirement that flexible use licensees not exceed pfd limits for IBE and OOB at an FSS earth station antenna. This requires that the regulator have an accurate list of all deployed FSS earth stations. Intelsat recognizes that the more stringent OOB limit adopted by the

EU may hinder the operation and deployment of 5G handsets but it is important that these more stringent OOB limits be applied to flexible use base stations, which can be designed to meet these limits without significant impact and with the added benefit of facilitating protection of FSS earth stations.

Overall, Intelsat supports ISED adopting the FCC coexistence measures in Canada with the following changes: 1) a more stringent OOB power limit is recommended for base stations, specifically the OOB power limits for base station should be -40 dBm/MHz or lower; 2) the OOB PFD threshold at the earth station antenna should be adjusted to appropriately protect of earth stations with elevation angles lower than 19 degrees. Intelsat proposes that either the FCC level of -124 dBW/MHz/m<sup>2</sup> that accounts for earth stations with minimum elevation angles of 19 degrees be modified to -134 dBW/ /MHz/ m<sup>2</sup> to account minimum elevation angles of 6 degrees or that coordination be required if the elevation angle (technically the off-axis angle between FSS and 5G base station) is less than 19 degrees.

### **Co-channel**

**Q49:** ISED is seeking comments on what technical requirements should be imposed to ensure cochannel protection of FSS earth stations from flexible use systems, in the relevant scenarios and timeline as stated in sections 9.5 and 9.6. For example, could the pfd limit of -124 dBW/m<sup>2</sup>/MHz measured at the earth station antenna proposed by FCC above be used to protect co-channel FSS earth station? Alternatively, should other measures be adopted, such as a separation distance as described in section 7.3? Or should a combination of measures be adopted? If applicable, what are the specific values that should be adopted?

Intelsat recommends careful consideration of the technical requirements to ensure co-channel protection of FSS earth stations from flexible use systems. For example, the PFD limit of -124 dBW/m<sup>2</sup>/MHz adopted by the FCC was based on an assumed elevation angle of 19 degrees. Technically, the angle of incidence off-boresight is the key parameter rather than the elevation angle. However, when the FSS and 5G base station are at the same height, the angle of incidence off-boresight is the same as the elevation angle. For simplicity, the term “elevation angle” is used here. This corresponds to an off-axis gain of 0 dBi.<sup>31</sup>

C-band FSS satellites serving Canada can be located on the geostationary arc as far east as 1° W.L. to as far west as 139° E.L., resulting in earth stations with elevation angles much lower than 19 degrees. To illustrate, an earth station located in Halifax, Nova Scotia communicating with a satellite at 133° W.L. will have an elevation angle of 5.8 degrees, while an earth station located in Vancouver, British Columbia and communicating with a satellite at 37° W.L. will have an elevation angle of 6.1 degrees. Accordingly, the FCC

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<sup>31</sup> This gain calculation is based on the antenna gain mask defined in the FCC Rules & Regulations §25.209 (1)

assumed PFD limit did not consider – and likely will not protect – all earth stations deployed in Canada, resulting in some that will likely experience harmful interference. This is of concern for ISED since Canada on average will have lower elevation angle earth stations compared to the Continental United States. The impact of the elevation angle can be significant; as an example, for 10 degree and 6 degree elevation angles will result in 3.5 dB and 7.4 dB loss to carrier-to-noise ratio, respectively. Moreover, the FCC did not impose any antenna height limits on flexible use base stations, which would have decreased the likelihood that the angle of incidence would be lower than the 19 degrees.

As addressed in our response to Question 48, Intelsat proposes that ISED adopt a PFD limit measured at the earth station of  $-134 \text{ dBW/ /MHz/ m}^2$  to account for earth stations with minimum elevation angles of 6 degrees or that coordination be required if the elevation angle (technically the off-axis angle between FSS and 5G base station) is less than 19 degrees.

#### **Earth station technical parameters**

**Q50:** ISED is seeking comments on whether the assumptions made by the FCC about earth stations, including baseline minimum filter specifications for earth station operations as stated above, are applicable to Canadian operations. Is there any additional information that ISED should consider in the development of appropriate technical rules to enable coexistence both cochannel and in adjacent bands?

In providing comments, respondents are requested to include supporting technical arguments and rationale.

In providing comments to Q46-Q49, respondents are requested to consider the coordination burdens such coexistence and protection measures could impose on either flexible use services or FSS earth stations.

Intelsat recommends that ISED adopt the same baseline minimum filter specifications that the FCC adopted for Canadian operations.

The bandpass filter is essential for 5G and FSS co-existence in adjacent bands. The 20 MHz guard band strikes a good balance between spectrum usage and realizable band pass filter performance. The number of filter cavities required to build the filter is also of reasonable size and easily fits between the antenna and the LNA/LNB.<sup>32</sup>

**Q52:** ISED is seeking comments on the use of an auction as the licensing process for the flexible use spectrum that would be considered as the 3800 MHz band, noting a separate consultation process would be issued, if required, to determine the licensing framework for the range 3900-3980 MHz.

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<sup>32</sup> See also response to Question 48.

In providing comments, respondents are requested to include supporting arguments and rationale

As set out above in paragraph 49, Intelsat takes no position regarding the appropriate regulatory mechanism for issuing flexible use licenses in the band *per se*. However, for the reasons cited above, whatever licensing regime is employed must incorporate a means for compensating all satellite operators – both domestic and foreign – who have undertaken the arduous task of clearing the spectrum for the benefit of, and transferring the value in the spectrum to, these flexible use licensees, as well as for the benefit of the Canadian public

Intelsat incorporates paragraphs 49 to 57 above into its response to this question.

**Q53:** ISED is seeking general comments on the proposal submitted by Telesat found in annex H, including whether such an approach would be in the best interest of Canadians and more specifically, whether it would result in the faster deployment of 5G services in the affected frequencies; more efficient use of spectrum and what the implications of this repurposing plan would be for other users of the band.

Although the Telesat proposal, as currently constituted, includes certain positive elements, including providing an accelerated timeline for clearing spectrum for 5G, as currently constituted it is not in the best interests of Canadians.

Intelsat's specific concerns with the Telesat proposal are outlined above and reproduced here. These concerns relate to the amount of spectrum to be cleared, the lack of any compensation for foreign C-band operators, and the role that Telesat appropriates for itself in the migration of all C-band users, including customers of competing C-band providers.

ISED's proposal to repack C-band services into the 4000-4200 MHz frequencies, except in satellite dependent areas, will align spectrum use in Canada with that in the U.S., both for C-band services as well as 5G mobile, thereby providing Canada with significant benefits. As noted in the Consultation, Canadians consumers benefit from economies of scale realized when spectrum being made available reflects global trends.<sup>33</sup> Intelsat also notes the efficiency of aligning spectrum use on both sides of the Canada-U.S. border, which will benefit satellite operators, mobile operators, and users of both services. In contrast, Telesat's proposal to require C-band operators to repack their C-band activities within the 4100-4200 MHz frequency band will deny these benefits to Canada.

Telesat's proposal not to either issue flexible use licences to, or permit foreign C-band operators to play a central role in clearing the band – even with regard to those operators'

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<sup>33</sup> Consultation, para. 9.

own customers' migration – detract significantly from the efficiency and fairness of its approach.

The revisions proposed by Intelsat to the Telesat proposal would result in:

- (a) An equally fast deployment of 5G services in the affected frequencies, as like Telesat, Intelsat is proposing an earlier transition date for the lower 200 MHz of spectrum to be reallocated;
- (b) A more efficient use of spectrum in that the same 280 MHz of spectrum that would be reallocated in the U.S. for flexible use operations and the same 200 MHz of spectrum into which C-band satellite services would be repacked would be allocated for the same uses in Canada, thereby achieving significant synergies and scale economies not only in 5G handsets and base stations, but also the space and ground segments of satellite networks;
- (c) Fair “national treatment” of all C-band providers currently operating in Canada, by ensuring compensation of all C-band incumbents, both domestic and foreign (whether through transferable flexible use licences under Telesat’s construct or allocation of auction proceeds under ISED’s public auction construct); and
- (d) A far more efficient and user-friendly process for clearing the C-band, by directly involving the cooperation of all C-band operators (both domestic and foreign) in the coordination of their own customers’ migration.

Intelsat incorporates paragraphs 49 to 57 above into its response to this question.

**Q54:** ISED is seeking comments on whether the Telesat proposal meets ISED’s policy objectives outlined in section 3, including:

- a) supporting rural/remote connectivity
- b) promoting competition in mobile services
- c) making more mid-band spectrum available to support 5G services

See Intelsat’s response to question 53. More specifically, the Telesat proposal, as currently constituted:

- a) would not support rural/remote connectivity – Telesat’s proposal does not include a provision for continued use of C-band services throughout the 3700-4200 MHz band in satellite-dependent areas, which are primarily rural and remote areas that rely on C-band FSS for critical connectivity services, including telephony and Internet access;

- b) would be at best neutral for promoting competition in mobile services – although it could be argued that making more mid-band spectrum available for 5G services could help to promote competition in this segment, there is no evidence that the Canadian mobile industry has a need for the full 400 MHz as proposed by Telesat, or that the licensing of this amount of spectrum will have the effect of enhancing competition for mobile services; and
- c) would meet the objective of making more mid-band spectrum available to support 5G services at first blush – however, the fact that the additional amount of spectrum that would be made available under Telesat’s proposal (i.e., 4000-4100 MHz) will not be aligned with 5G services in the U.S., calls into question both the practicality and efficiency of this approach. See Intelsat’s responses to question 59. Intelsat also notes that under Telesat’s proposal, the second 200 MHz would not be cleared until 2025.

**Q55:** ISED is seeking comments on what elements from sections 7 to 10 of this consultation would still apply or need to change if ISED were to implement the Telesat proposal, in particular:

- a) the proposal for maintaining the primary allocation for FSS in the 3700-4200 MHz band
- b) the proposed implementation of an exemption to transition for satellite-dependent communities and the proposed changes to satellite licenses to apply it
- c) the proposal for treatment of WBS incumbents
- d) the proposal to issue interim authorizations for certain existing licence-exempt earth stations in the 3700-4200 MHz band
- e) technical considerations for coexistence between FSS and flexible use
- f) technical considerations for coexistence between flexible use and aeronautical radionavigation systems
- g) the overall impact on existing users in the 3700-4200 MHz band

- a.) The Telesat proposal would not affect this element. However, Telesat’s proposal condenses all satellite services in one-fifth of the spectrum currently being used now. The remaining spectrum reserved for FSS would make it quite challenging to build an ecosystem around this limited spectrum.
- b.) The Telesat proposal does not support the concept of Satellite Dependent Areas, and therefore, all of Canada will be required to transition out in accordance with Telesat’s timeline.
- c.) Telesat does not explicitly contemplate the fate of WBS in its proposal. However, given that the spectrum designated for WBS in the ISED plan --namely 3900-3980 MHz-- will not be cleared until December 2025, WBS providers will have to remain in their current band until that time before they are transitioned to the new band.
- d.) The Telesat proposal would not affect this element.

- e.) All the analyses and studies that were done in the course of the U.S. C-band proceeding about compatibility between FSS and flexible use licensees were based on FSS retaining the 4000-4200 MHz band. No studies were conducted on the implications of narrowing the FSS band or the size of the guard band, the lifter design in terms of the linearity and insertion loss performance of such filter. All studies done under the U.S. C-band proceeding would have to be reevaluated under the Telesat proposal. It cannot be assumed that the rules adopted by the FCC would automatically apply if the FSS passband is reduced to 4100-4200 MHz.
- f.) Allowing flexible use licensees to operate 100 MHz closer to aeronautical radio navigation systems requires further study and analysis. Telesat did not consider if there will be any impact
- g.) The proposal to repack all existing users into one-fifth of the spectrum currently used would adversely affect existing users. This likely to create shortage of capacity for C-band users.

**Q56:** If ISED were to implement the Telesat proposal, ISED would need to consider the licensing framework for the 3700-3900 MHz band. Thus, ISED is seeking comments on:

- a) whether it should, as proposed by Telesat, issue flexible licences in the 3700-3900 MHz band using the same conditions of licence as those contained in annex H of the 3500 MHz Framework, noting that some conditions may need to be adjusted to reflect the differences in the two bands and the decisions resulting from this consultation process
- b) whether it should issue a single Tier 1 flexible use licence as proposed by Telesat or align with the 3500 MHz band and issue Tier 4 licences
- c) what deployment conditions should apply to these licences including Telesat's proposal that the deployment requirements would only come into force after the Minister approves a transfer
- d) any additional conditions of licence that should apply given the nature of the proposal

See Intelsat's response to question 5.

**Q57:** In its proposal, Telesat indicates that it takes no position on ISED imposing a pro-competitive measure such as a spectrum cap or set-aside on the 3700-3900 MHz licences. ISED would review any request for transfer in accordance with provisions related to commercial mobile spectrum through section 5.6 of CPC-2-1-23, *Licensing Procedure for Spectrum Licences for Terrestrial Services*. However, ISED would also consider the competitive implications on the 3500 MHz and 3800 MHz bands and consider pro-competitive measures in accordance with the Framework for Spectrum Auctions in Canada. As such, ISED is seeking comments on:

- a) the need for a pro-competitive measure (e.g. spectrum cap or set-aside)
- b) the type of competitive measure that should be applied

- c) the amount of spectrum that should be considered under any such competitive measure

Like Telesat, Intelsat takes no position on ISED imposing a spectrum cap or set-aside on the 3700-3900 MHz licences.

**Q58:** ISED is seeking comments on Telesat's proposals for the transition of FSS earth stations and whether any additional measures are required to ensure a smooth transition.

Telesat's proposal is fundamentally flawed in this respect because it is predicated on an assumption that Telesat can single-handedly manage the transition for all satellite operators with C-band services in Canada. Telesat does not possess the knowledge about the satellite transition plans for every satellite operator and has no relationships with the customers of foreign satellite operators. Therefore, Intelsat strongly believes that it is practically impossible for Telesat to undertake the transition for all satellite operators.

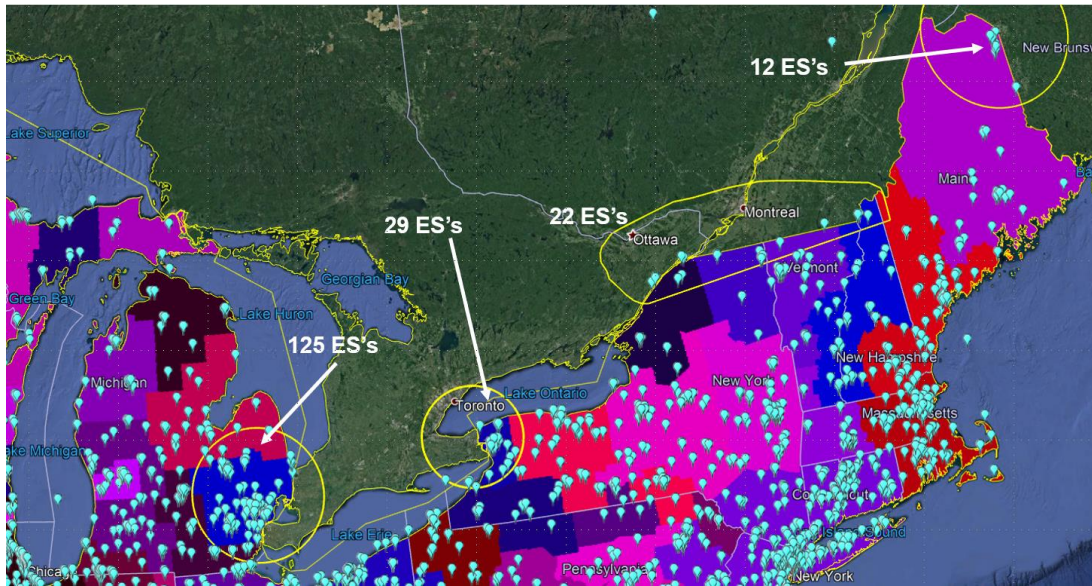
**Q59:** Telesat's proposal includes ISED allocating an additional 80 MHz for flexible use in the 4000-4100 MHz band. ISED is seeking comments on the feasibility of making this extra spectrum available, specifically:

- a) whether there would be standardized 5G equipment available for this 80 MHz, given that it does not align with the U.S. band plan
- b) whether there would be FSS filters available, given the reduced amount of FSS spectrum and that it would not align with the U.S. band plan
- c) whether there would be enough capacity to continue FSS services in Canada with the proposal to reduce the amount of FSS spectrum to 100 MHz
- d) to what degree would the requirement to protect U.S. FSS earth stations in the border areas have an impact on the ability to deploy flexible use stations near the border and to what degree would this impact the value of this spectrum

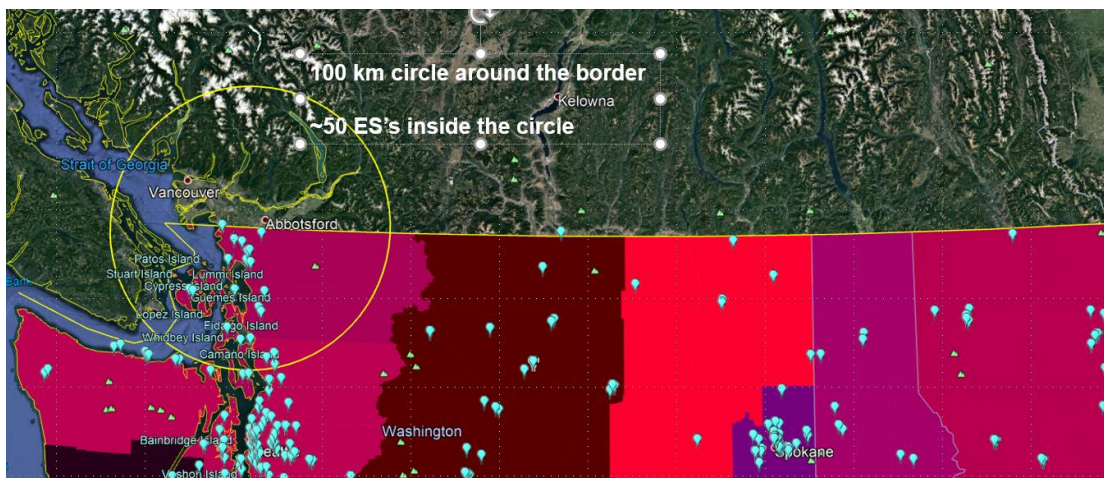
- a.) The existence of an ecosystem to support this 4000-4100 MHz band is certainly questionable. Only Japan has allocated this band to mobile/flexible use. Europe only uses the 3400-3800 MHz band for mobile, and some countries like the UK are considering shared use for the 3800-4200 MHz band. Therefore, it is safe to conclude that the mobile ecosystem for the 4000-4100 MHz band is precarious at best.
- b.) Designing a bandpass filter to operate in the 4100-4200 MHz band with sharp roll-off on either side can pose a technical challenge that has to be assessed. Telesat did not contemplate the technical aspects of their proposal in this respect.
- c.) Under the Telesat proposal, the remaining C-band capacity for FSS would be unviable for a vibrant FSS ecosystem.
- d.) The Telesat proposal creates a band plan that is misaligned with the U.S. band plan. It proposes to clear the 4000-4100 MHz band in Canada for flexible use



while this band in the U.S. will continue to be used by FSS. Consequently, flexible use licensees in areas close to the U.S. borders will be significantly encumbered by FSS operations in the U.S., which must continue to be protected. Therefore, the usability of the 4000-4100 MHz in Canada under the Telesat proposal will be constrained. To illustrate the extent of expected encumbrance that U.S. FSS operations in the 4000-4100 MHz along the U.S./Canadian borders would create, all C-band earth stations registered by the FCC were plotted particularly in areas that are close to major Canadian population centers. These plots are shown below for demonstration purposes.



Close-up of U.S. C-band Earth Stations close to Toronto, Ottawa, & Windsor



Close-up of U.S. C-band Earth Stations close to Vancouver