



October 26, 2020

Filed via Email

Innovation, Science and Economic Development Canada
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To Whom It May Concern:

Re. Canada Gazette, Part I, Volume 154, Number 37, September 12, 2020 – 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 (Notice No. SLPB-002-20) – Response of Corus Entertainment Inc.

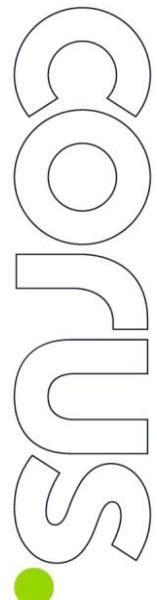
Introduction

Corus Entertainment Inc. (“**Corus**”) thanks Innovation, Science and Economic Development Canada (“**ISED**”) for the opportunity to respond to this consultation regarding the future use of the 3650-4200 MHz band (“**C-band**”).

In its stated policy objective, ISED seeks to provide Canadians with ubiquitous, affordable cellular service while taking into account the role of fixed satellite services (“**FSS**”) operations in Canada's telecommunications and broadcasting infrastructure. Like other Canadian broadcasters, Corus relies on C-band daily for critical access to programming (including news content). While Corus disagrees with the Federal Communications Commission’s (“**FCC**”) decision to allocate only 40% of the 3700-4200 MHz band for incumbent FSS use, we also recognize the importance of harmonized spectrum policy between neighbouring nations. As a result, this allocation is appropriate for Canada.

In recent years, the use of telecommunications fibre optic networks and Internet Protocol for content distribution has grown considerably, however satellite remains a backbone of the Canadian broadcasting ecosystem. Fibre optic networks are susceptible to disruption – with over 7,000 km from Victoria to St. John’s, a transcontinental fibre optic circuit may pass through several operators’ networks. Terrestrial networks also experience recurrent disruption. As a result, prudent broadcasters require contingencies, and satellite provides an essential parallel path.





Despite the perceived fragility of distributing content via spacecraft in orbit, C-band transmission delivers predictable results and provides important resiliency to terrestrial networks. To obtain programming from remote venues, satellite is often the only means of distribution to broadcasters. In 2018, the American Cable Association advised the FCC that, “C-band is the heaviest used medium for backhaul delivery of video to the systems of MVPDs, as well as to broadcast stations and other users. It is favoured by programmers and distributors alike because it rarely fails, is cost-effective, and is provided to MVPDs free of charge as part of their programming agreements”.¹

The partition of spectrum to permit the expansion of 5G and LTE is a reasonable policy choice. However, this decision carries significant operational risk to incumbent users if not executed with great caution. Corus believes the partitioning of spectrum should be conducted in accordance with the following principles:

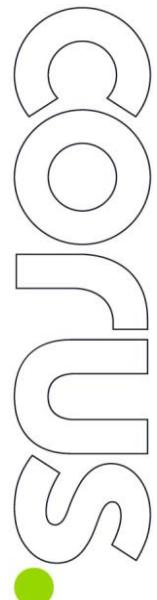
- In non-satellite-dependent areas, a generous guard band should be provided to separate spectrum use; no flexible use between 5G/LTE and FSS should be permitted.
- In satellite-dependent areas (such as Canada’s vast rural regions and the North), where FSS is the incumbent use of 3700-4200 MHz spectrum, FSS should be protected through defined exclusion areas.
- In both satellite-dependent and non-dependent areas, all FSS earth stations must be protected from in-band and out-of-band emission (“OOBE”) interference emanating from 5G and LTE operations.

Corus applauds ISED’s plan to allow licence-exempt FSS earth stations to register in the future and receive policy protection in the 4000-4200 MHz band. This is essential to ensuring broadcasters maintain undisrupted access to Canadian programming.

Some US telecom operators have suggested a relocation of FSS use well beyond urban communities, or the creation of community gateways that can serve all FSS users. These are unrealistic proposals that do not contemplate the economic burden either option may present to broadcasters. Further, they are likely not achievable during the short transition period, and would eliminate the important resiliency provided by dual content reception, upon which Canadian broadcasters rely.

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¹ “Expanding Flexible Use of the 3.7 to 4.2 GHz Band.” Comments of the American Cable Association, Federal Communications Commission, 29 Oct. 2018, <https://ecfsapi.fcc.gov/file/103074011275/ACA--C-band%20NPRM%20Comments%2029Oct2018.pdf>



We note with concern that some proposed changes to the 3650-4200 MHz band may require Canadian broadcasters to modify, replace or even relocate some earth stations, all of which would have significant cost consequences. In that event, ISED must undertake to reimburse broadcasters for these costs. After bearing 100% of the expense of two mandated spectrum relocations – 600 MHz and 700 MHz – in the last decade, our struggling industry simply cannot shoulder financial responsibility for further Government of Canada spectrum decisions. ISED should follow the approach taken by the FCC, which has compensated American over-the-air broadcasters from spectrum auction proceeds.

We provide responses to the ISED's consultation questions below. We have chosen to respond solely to questions directly related to broadcasting.

Responses to Consultation Questions

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.

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

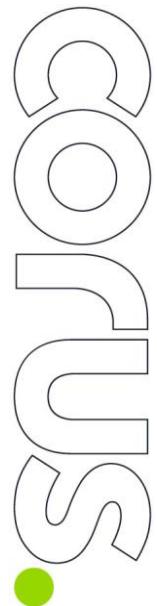
While spectrum is a scarce resource and consumer demand is driving the segmentation of the 3700-4200 MHz band, we must be clear that 5G and LTE are not technically compatible with FSS use. In 2004, ISED (Industry Canada) noted the extreme sensitivity of FSS downlink earth station low-noise block downconverters (“LNB”) to interference from Fixed Service (“FS”) microwave transmission.² Fortunately, FS is directional, predictable and can be deployed with caution to avoid impact to FSS.

Conversely, 5G mobile services will employ a large number of antennae in built-up communities with low directivity that are capable of introducing interference to FSS in-band and adjacent band, and present serious risk to FSS equipment and receive fidelity. As Intelsat noted in a report for the UK regulator, Ofcom, “it is also important to note that ITU studies (ITU-R Reports M.2109, S.2199 and S.2368) clearly showed that sharing between IMT-Advanced systems and FSS in the 3.6 - 3.8 GHz frequency bands is not feasible/possible in the same geographic area. Intelsat has long argued that the use of C-band by IMT systems is not practical”.³

² “SP 3-30 GHz - Revisions to Spectrum Utilization Policies in the 3-30 GHz Frequency Range and Further Consultation.” Spectrum Management and Telecommunications, Innovation, Science and Economic Development Canada, Oct. 2004, www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf05617.html

³ https://www.ofcom.org.uk/_data/assets/pdf_file/0027/96903/Intelsat.pdf





In Corus' view, flexible use of spectrum between FSS and mobile, within the same geographical area, is not technically feasible. In a 2020 study entitled 5G Cellular and Fixed Satellite Service Spectrum Coexistence in C-Band, the Institute of Electrical and Electronics Engineers (IEEE) concluded that the 5G and LTE base stations can interfere with co-channel FSS operations within 16 km if the two antennas are not aligned, and up to 40 km if the 5G base station antenna is aligned in the same orientation as the FSS antenna. Further, OOB interference clearly exists up to 16 km⁴.

As opposed to deciding on a flexible use scheme, ISED should allocate discrete spectrum within non-satellite dependent communities exclusively to mobile or FSS. Underserved rural communities and the North should be permitted to continue to operate licensed and unlicensed FSS exclusively, utilizing the entire 500 MHz band in defined exclusion zones.

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

No new FSS stations should be authorized in 3700-4000 MHz towns and urban areas. However, underserved rural communities and the North should be permitted to continue to build new licensed and unlicensed FSS utilizing the entire 500 MHz band in defined exclusion zones.

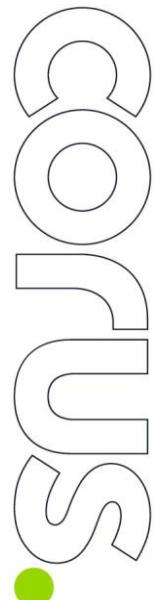
Q7: ISED is seeking comments on the proposal to implement a 20 MHz guard band between 3980-4000 MHz to protect FSS operations in the 4000-4200 MHz band from proposed flexible use operations in the 3700-3980 MHz band

A guard band is essential, but Corus believes the FCC allocation of 20 MHz is insufficient. At 20 MHz, wireless emission will still propagate to adjacent frequencies unless additional mitigating steps are taken. In its October 29, 2018 submission to the FCC, Nokia explained that the 20 MHz guard band must be utilized "in conjunction with a stringent spectrum mask for 5G base stations".⁵ 5G and LTE emissions at 3980 MHz has the potential to cause interference to adjacent frequencies up to and including 4020 MHz. Corus therefore recommends a wider

⁴ E. Lagunas, C. G. Tsinos, S. K. Sharma and S. Chatzinotas, "5G Cellular and Fixed Satellite Service Spectrum Coexistence in C-Band," in *IEEE Access*, vol. 8, pp. 72078-72094, 2020, doi: 10.1109/ACCESS.2020.2985012. <https://ieeexplore.ieee.org/document/9052737>

⁵ <https://ecfsapi.fcc.gov/file/102976959340/Nokia%20Comments%20on%203.7%2010-29-2018%20FINAL.pdf>





guard band of 50 MHz. This allocation would better protect FSS operations from aggregate OOB interference.

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

In populated centres, there is growing need for telecom providers to attain growth spectrum for consumer mobile use. In satellite-dependent areas, FSS is an essential service connecting communities in rural areas and the North. Recognizing the intent of the consultation is to find a path to sharing scarce spectrum resources, Corus prefers a more equitable spectrum plan that would allocate 250-280 MHz for 5G and LTE, and 200 MHz for FSS in non-satellite-dependent areas and preferential use of the entire 3700-4200 MHz band for FSS in satellite-dependent areas.

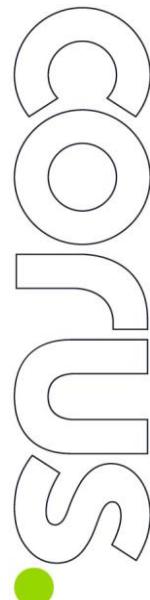
Q20: ISED is seeking comments on its proposal that existing FSS earth stations licensed in 3650-3700 MHz after June 11, 2009, be permitted to continue to operate on a no-protection basis with respect to proposed new flexible use operations

Corus has no objection to the proposed change to the 3650-3700 MHz band.

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

ISED should limit FSS operations in 3700-4000 MHz in non-satellite-dependent areas of Canada to a no-interference basis. ISED should also permit the continuation of FSS operations in 3700-4000 MHz in satellite-dependent areas of Canada to minimize economic and connectivity challenges for rural communities and the North.





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

Corus does not believe December 2023 is an appropriate deadline for the FSS transition. Instead, we urge ISED to adopt the FCC mandated end date of December 5, 2025 for vacating the 3700-4000 MHz spectrum. We note the incumbent, foreign satellite providers are attempting to capitalize on lucrative financial incentives available in the United States should they meet the accelerated clearing date. Canada should not be influenced by these incentives. The logistical challenges of the US launches are substantial, and any delay will make it incredibly challenging to achieve this precarious milestone. Given the Canadian process is already lagging the American process, a deadline of December 2025 would be more practical.

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

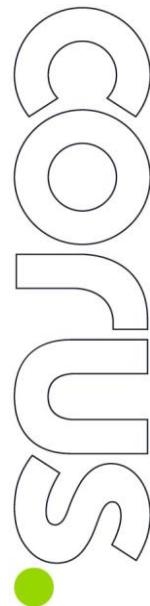
Corus utilizes FSS to access remote broadcast programming feeds (transmission from the event venue), US network and international programming feeds, and international news contribution for Corus broadcast properties as well as several third-party Canadian broadcasters that are serviced by our Quay Media Services (QMS) broadcast origination subsidiary.

Corus does not enter into direct contracts with foreign satellite operators for C-band spectrum. Corus licenses content from foreign studios and news organizations who in turn distribute content to multiple broadcast partners via C-band satellite. The satellite expense is contained within the programming fees charged to Corus and unrelated broadcasters serviced by QMS.

The US transition will stimulate foreign content providers to change frequencies and spacecraft, resulting in an adjustment of look angle and tuning for Corus broadcast earth stations. Some foreign studios may be unable or unwilling to access satellite spectrum in the future, adding risk, complexity, and incremental cost to alternate means of program acquisition by Canadian broadcasters.

The US transition will put stress on the supply of C-band capacity for sports. There is an increasing trend whereby remote sports productions use satellite to distribute program and individual camera feeds, putting stress on available bandwidth.





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

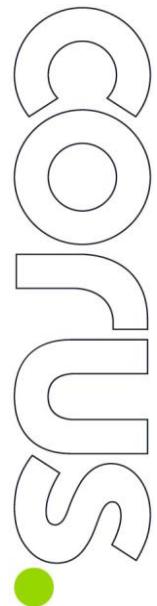
Please note Corus' response to this question has been filed confidentially in a separate document.

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

The target transition date is dependent on the success of an accelerated US transition process that necessitates the construction and launch of several new spacecraft. If Canada licenses any portion of C-band spectrum to 5G and LTE prior to the completion of the US transition, Canadian broadcasters will be unable to receive foreign content due to domestic in-band interference. Canadian 5G and LTE deployment must not precede the US transition.

Given the Canadian process is already lagging the American process, a deadline of December 2025 would be more appropriate.





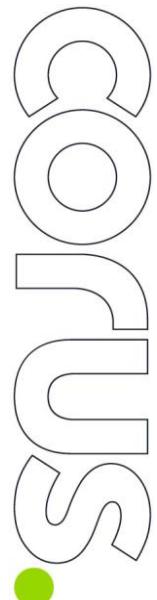
Q28: ISED is seeking comments on making amendments to the relevant conditions of licence and technical rules in the 3700-4200 MHz band as well as the 3450-3700 MHz band in order to implement the following proposals with respect to protection from interference:

- 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)

Flexible use operations are not possible in-band within the same community. In our response to Question 5, we described an IEEE study,⁶ which found that interference potential exists up to 40 km if the 5G base station antenna is aligned in the same orientation as the FSS receive antenna. As such, 5G and LTE operations must be coordinated within 40 km of a FSS earth station.



⁶ <https://ieeexplore.ieee.org/document/9052737>



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*

Corus is unclear what the term “gateways” connotes in Question 30.

It could presumably refer to the concept of “consolidated gateways” that has been proposed by US telecom operators to rapidly accelerate the deployment of spectrum. However, there would be numerous obstacles to implementing this proposal in Canada.

First, no such plan has been shared with Canadian broadcasters to date, and a plan to connect all FSS users in Canada to two gateway sites would be impractical.

Second, building such sites and providing national terrestrial connectivity in three years would require sizable economic investment, and very likely exceed the ability of constituent FSS operators to fund.

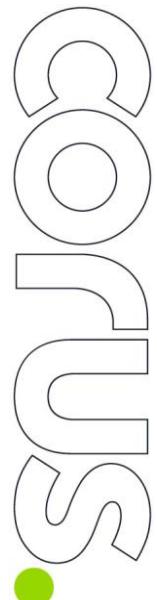
Third, the task of defining the required spectrum at the gateway sites would require all FSS operators to submit detailed business information that is beyond the scope of this consultation and thus require a separate process. Determination of the best gateway locations would require review of the proposed C-band North American Beam patterns for new spacecraft launching in the next few years.⁷

Finally, in satellite-dependent areas, by definition, satellite receiver capability cannot be consolidated into two sites. It is impractical to service the North and many rural areas of Canada with land-based, terrestrial networks. That is why many remote communities are in-fact satellite dependent.

For these reasons, we suspect ISED might have intended another meaning for “gateways,” Question 30, and would request further clarification.



⁷ Anecdotally, southern Ontario and southern British Columbia commonly have favourable C-band reception characteristics.



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

Corus receives and broadcasts satellite distributed news and programming content to Canadians every day. Interim authorizations for radio and television broadcaster FSS sites in the 3700-4200 MHz band are appropriate and essential to maintain interference-free reception of foreign content until C-band operations are reduced to the 4000-4200 MHz band.

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

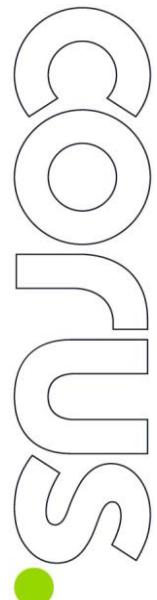
Corus believes 90 days would be an appropriate timeline if ISED proposes an administratively seamless application process that allows organizations to file data in bulk. If ISED envisions a more cumbersome application process then a longer period would be required.

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

Members of the public and organizations receiving content where no commercial arrangement exists between content provider and consumer should continue to operate as licence-exempt on a no-protection basis. Organizations with bona-fide commercial dependence on FSS, such as radio and television broadcasters, should be required to participate in a licensing regime and obtain regulatory authorization.

ISED should provide a mechanism whereby radio and television broadcasters can seek authorization in the future for expansion of FSS capability at existing or new sites. As operational requirements change from time to time, it is reasonable to expect that broadcaster needs will change, including the need to license temporary and portable facilities.





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

Radio and television broadcasters operating in non-satellite-dependent areas should operate under interim authorizations with protection from interference until the transition deadline.

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

All existing earth stations operating in satellite-dependent areas should operate under interim authorizations and receive in-band protection until the transition deadline.

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

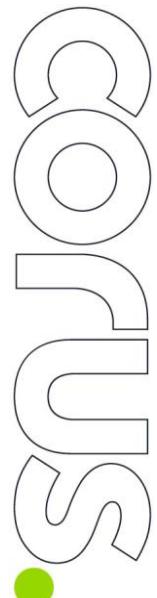
The ISED interim authorization process should also apply to new receive-only FSS earth stations in the 4000-4200 MHz band. In addition to serving federal public policy interests, it would allow for better coordination of spectrum. That protection must extend to OOBE power flux density (PFD) emissions that can cause harmful interference to earth stations.

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

Radio and television broadcasters must continue to have full band/full arc use of 3700-4200 MHz during the interim period and full band/full arc use of the 4000-4200 MHz following the transition.

Greater clarity is needed regarding the meaning of the phrase “Identical earth stations”. Annex G states, “Identical earth stations has the meaning as set out in CPC-2-6-01”. However, CPC-2-6-01 describes, “identical earth stations using specific frequencies”. This does not clarify whether the “station” here refers to the manufacturer/model, location or satellites acquired. We therefore request further clarification.





FSS Operators access frequencies across the entire allocated band and regularly relocate the look angle to receive content from different satellites. For this reason, the proposed conditions must provide protection from in-band PFD emissions during the transition period and following the transition, protection from OOB E PFD emissions and front-end overload.

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

Members of the general public and groups receiving content where no commercial arrangement exists between content provider and consumer should continue to operate as licence-exempt on a no-protection basis. Organizations eligible to apply for interim authorization should include such enterprises where a bona-fide need can be established, such as commercial arrangements whereby premium content is distributed to the enterprises via satellite for consideration. This includes radio and television broadcasters, traditional and non-traditional media organizations, news organizations, theatre operators, broadcast distribution undertakings (BDU), educational institutions, and religious organizations.

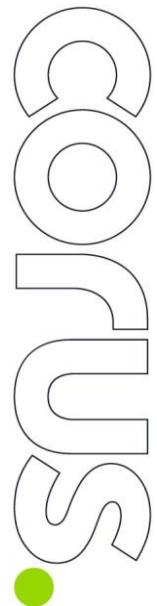
Q40: ISED is seeking comments on its proposal to no longer issue new licences for fixed services to operate fixed point-to-point applications in the 3700-4000 MHz band

Corus supports ISED Decision number 6: no new fixed point-to-point services should be licensed in the 3700-4000 band.

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

Corus does not believe any new fixed point-to-point services should be authorized in the 4000-4200 band. New fixed point-to-point services should utilize higher frequency spectrum reserved for this use.





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

In our response to Question 5, we mentioned an IEEE study⁸ which found that interference potential exists up to 40 km if the 5G base station antenna is aligned in the same orientation as the FSS receive antenna. As such, 5G operators should not utilize the 3650-3700 MHz band within 40 km of any FSS site until the transition deadline. We recommend this given the lack of adequate guard band during the transition period to protect sensitive equipment.

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

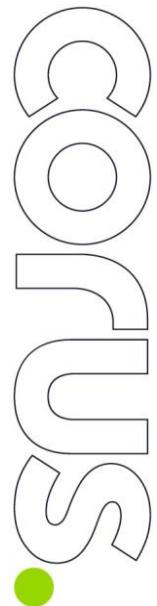
Corus has no objections to this proposal.

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)?*



⁸ <https://ieeexplore.ieee.org/document/9052737>



It is important to note that all operators have a mutual interest in mitigating interference. However, where many operators are utilizing congested bandwidth and technology that is a known risk to sensitive FSS receive equipment, ISED's role is unclear. As a starting point, then, Corus urges ISED to establish and enforce a clear set of guidelines, which protects incumbent FSS from co-channel interference, OOB interference and front-end overload caused by new entrants.

Fixed, temporary and transportable FSS earth stations must be protected from interference, including existing and future installations. Resolution of interference is the sole responsibility of the 5G and LTE base station new entrant, not the incumbent FSS operator.

Furthermore, we urge ISED to acknowledge that new entrants, and not earth station owners, should be primarily responsible for addressing disruptions. For example, new entrants and not earth station owners, should be expected to conduct in-depth measurements, determine causes of disruptions in the case of aggregation, and making changes in response to frequency shifting.

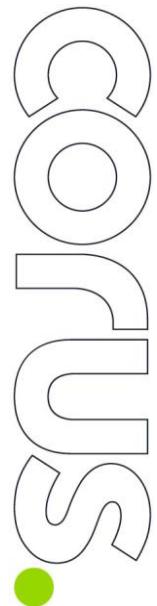
PFD limits should be enforced using a clear method and measurement technique, and any interference suffered by the FSS operator should result in an immediate response by the telecom operator to cease 5G and LTE operations until a solution to interference is found.

LTE and 5G technologies are more resilient to interference than older technologies. However, FSS earth stations (which receive low-powered signals from orbiting spacecraft 36,000 km away) are highly susceptible to interference. As such, FSS requires careful protection from in-band and OOB interference.

In conclusion, Corus makes the following specific recommendations:

- (a) Policies should recognize FSS to be the incumbent technology, which must be protected from interference from emerging technologies.
- (b) FSS in satellite-dependent areas should have exclusive use of the entire 3700-4200 MHz spectrum.
- (c) FSS in non-satellite-dependent areas must have exclusive use of 4000-4200 MHz spectrum with the following protective measures:





- A guard band must be established to separate 5G and LTE from FSS. ISED suggested a 20 MHz guard band in 3980-4000 MHz. The ISED proposal aligns with 5G industry recommendations such as that of the C-band Alliance to the FCC⁹, and that of Nokia to Infocomm Singapore¹⁰, but is insufficient to adequately protect FSS from interference in the lower end of the 4000-4020 MHz band.
- While a guard band is essential, Corus believes the FCC allocation of 20 MHz would be insufficient. At 20 MHz, wireless emission will still propagate to adjacent frequencies unless additional mitigating steps are taken. 5G and LTE emissions at 3980 MHz has the potential to cause interference to adjacent frequencies up to and including 4020 MHz. Corus therefore recommends a wider guard band of 50 MHz, to protect FSS operation from aggregate OOB interference.
- A spectral mask, pursuant to the 3rd Generation Partnership Project (3GPP) guidance¹¹ should be applied to ensure spurious 5G and LTE base station transmissions do not impact 4000-4200 MHz.
- FSS operators must be protected from mobile base station OOB and RF front-end overload up to a 40 km ring around the earth station¹².
- We ask ISED to require 5G and LTE operators planning base station construction within 40 km of a FSS installation, to:
 - Submit a study to ISED and the FSS incumbent demonstrating base station operation will not exceed the PFD limit at any azimuthal point around a 150m ring centered around the earth station. For greater clarity, the PFD limit should be apportioned to operators in the 40 km ring, so if there are multiple operators and multiple base stations within the ring, the sum of all operators' base stations does not exceed the PFD limit.

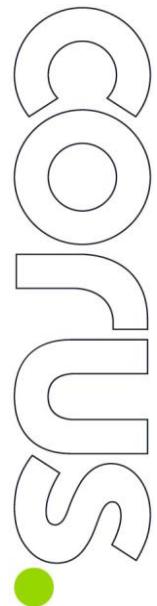
⁹ <https://ecfsapi.fcc.gov/file/1029067703990/C-Band%20Alliance%20NPRM%20Comments%2010.29.2018.pdf>, page 32

¹⁰ <https://www.imda.gov.sg/-/media/Imda/Files/Regulation-Licensing-and-Consultations/Consultations/Consultation-Papers/Second-Public-Consultation-on-5G-Mobile-Services-and-Networks/Second-5G-Consultation-Nokia.pdf?la=en>, page 6

¹¹ https://www.etsi.org/deliver/etsi_ts/138100_138199/13810102/15.02.00_60/ts_13810102v150200p.pdf

¹² <https://ieeexplore.ieee.org/document/9052737>





- Aggregate emissions from all mobile base stations/operators in the new network deployment does not exceed a maximum PFD at the FSS earth station LNB of -128 dBm/MHz in 3900-4200 MHz (aggregate power 10 dB below the noise floor), and -81.6 dBm/MHz in 3700-3900 MHz (measured after 43 dB rejection filter in the adjacent band).

Q49: ISED is seeking comments on what technical requirements should be imposed to ensure co-channel 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/m²/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?

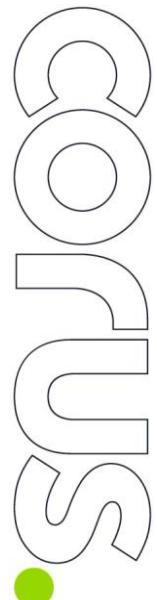
Flexible use of spectrum is only possible in satellite-dependent areas whereby a 5G or LTE base station in one community does not exceed a PFD limit of -128 measured at the FSS earth station in another community. Shared use of 5G and LTE with FSS operations in the same frequency, in the same community, is not feasible given the enormous potential for interference. For this reason, flexible use in non-satellite-dependent areas should not be entertained.

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 co-channel and in adjacent bands?

Corus concurs with ISED in paragraph 166 of the consultation document that national regulators must put technical requirements in place to protect adjacent band operators from OOB emission interference.

Flexible use systems below the 4000 MHz band in Canada should not commence operations until the necessary clearing has been completed. Implementation of PFD limits, and a generous guard band are essential for Canada. Corus recommends a guard band of 50 MHz, to protect FSS operation from interference. The C-Band Alliance recommended, and Corus agrees, that maximum PFD at the FSS earth station LNB, of -128 dBm/MHz in 3900-4200 MHz (aggregate power 10 dB below the noise floor), and -81.6 dBm/MHz in 3700-3900 MHz (measured after 43 dB rejection filter in the adjacent band) is appropriate. In its decision, we urge ISED to stipulate this will be the level of compliance measured at the earth station antenna as a total





limit from all emissions. This should not represent a limit for each individual operator and multiple operators cannot assume that they can exceed this level as an aggregate group.

Corus does not believe a coordination distance of 25 km (as outlined in paragraph 173) would be sufficient. The previously mentioned IEEE study concerning co-channel and OOB interference determined that 40 km is a more appropriate coordination distance between mobile base stations and FSS earth stations¹³. In addition to OOB and co-channel interference, adequate separation distance is required to protect earth stations from front-end overload.

The availability of filters suitable for use on a wide variety of earth station equipment and vintage by December 2023 is an optimistic assumption. Some earth stations will simply be unsuitable for modification.

We note with concern that the FCC has specified that some FSS operators may need to reconfigure or replace existing facilities.¹⁴ If ISED issues a decision that causes Canadian broadcasters to incur unplanned expenses it must undertake to reimburse impacted broadcasters for those costs. Our struggling industry simply cannot bear financial responsibility for further Government of Canada spectrum decisions.

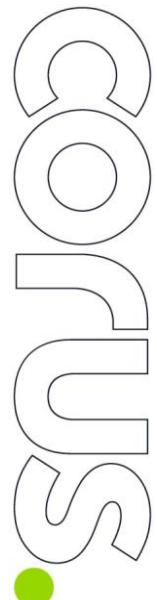
ISED will recall that Canadian over-the-air broadcasters are being required to vacate the 600 MHz spectrum, at significant cost. We are incurring these expenses to this day, and will continue to do so until at least 2022. The 600 MHz repack was undertaken for the sole benefit of 5G and LTE new entrants, with auction proceeds benefiting the federal treasury. Canadian over-the-air broadcasters bore 100 percent of the cost of conversion; we received no compensation from the Government of Canada. ISED's approach stands in sharp contrast to that of the FCC, which elected to compensate US over-the-air broadcasters for cost of vacating spectrum.

This followed a previous mandated conversion. In 2011, Canadian television broadcasters were required to convert analog over-the-air transmission facilities to the ATSC digital standard in order to make the 700 MHz band available for mobile services. This obligated broadcasters to change and upgrade their transmission facilities, placing significant financial and technical strain. Impacted broadcasters were required to convert 145 stations to DTV over a two-year period from June 2009 through August 2011. Again, Canadian television broadcasters bore 100 percent of the cost of conversion; they received no compensation from the Government of Canada.

¹³ <https://ieeexplore.ieee.org/document/9052737>

¹⁴ <https://docs.fcc.gov/public/attachments/DOC-351868A1.pdf>





The FCC set forth guidelines in FCC-20-22 whereby incumbent space station operators and incumbent earth station operators can seek reimbursement for reasonable costs, from earth station modification to relocation, and including engineering, consulting, legal and financing costs resulting from the decision to repurpose spectrum¹⁵. We strongly urge ISED to adopt this approach in respect of any changes to the 3650-4200 MHz band.

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

[Please note the following response also addresses Questions 54-59]

Corus urges ISED to reject the Telesat proposal. Spectrum use must be coordinated between all countries in a geographic region, particularly when the neighbouring country is the United States. The FCC has already decided on flexible use in the 3700-3980 MHz band and FSS use in the 4000-4200 MHz band. The Telesat proposal contradicts the FCC plan by allocating the 3700-4080 MHz band for flexible use and 4100-4200 MHz band for FSS. If implemented, it would thus threaten Canadian access to foreign satellites operating in the 4000-4100 MHz band by introducing 80-100 MHz of in-band 5G and LTE interference. The Telesat proposal has not contemplated how foreign programming and news can be accessed on foreign satellites in the 4000-4100 MHz band. It is not workable for Corus for that reason.

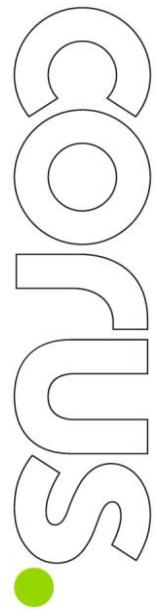
Telesat's proposal is also notably inconsistent with its response in ISED's 2018 consultation, when it stated:

C-band fixed satellite-service ("FSS") is used extensively for the delivery of broadcasting services throughout Canada, as well as to support vital communications services to locations that are not served by terrestrial networks, including telephone and internet connectivity to rural and remote communities. There is a large installed base of C-band satellite infrastructure that supports these critical services. No significant change in broadcasting demand for C-band FSS is forecast within the next five years.¹⁶

¹⁵ <https://docs.fcc.gov/public/attachments/FCC-20-22A1.pdf>

¹⁶ Comments of Telesat Canada in response to: Canada Gazette, Part I, October 21, 2017, Consultation on the Spectrum Outlook 2018 to 2022, SLPB-006-17 and Canada Gazette, Part I, December 30, 2017, Extension to the Comment Period: Consultation on the Spectrum Outlook 2018 to 2022, SLPB-010-17 [https://www.ic.gc.ca/eic/site/smt-gst.nsf/vwapj/SLPB-006-17-TELESAT-CR.pdf](https://www.ic.gc.ca/eic/site/smt-gst.nsf/vwapj/SLPB-006-17-TELESAT-CR.pdf/$file/SLPB-006-17-TELESAT-CR.pdf)





It is questionable that 200 MHz is sufficient capacity for North America, given the increased use of C-band spectrum by remote sporting events to distribute program and camera feeds. Given Canadian dependence on US program supply, 100 MHz is clearly insufficient.

The Telesat proposal does not meet ISED's policy objectives as Canadian consumers and mobile operators benefit from the economies of scale of a global supply chain. The proposed flexible use allocation above 4000 MHz will require customization of infrastructure and consumer handsets.

Further, Telesat's assertion that their proposal will "reduce wireless prices by 25% through lower 5G spectrum and infrastructure costs and enhanced sustainable wireless carrier competition"¹⁷ is simply not supportable. Telesat is neither a mobile service provider nor an LTE equipment manufacturer.

In conclusion, Corus notes that ISED commented in paragraph 64 of its consultation document that, "there is a trend in the global satellite industry of shifting towards higher frequencies, such as the Ku and Ka bands in 12-18 GHz and 26-40 GHz respectively, and that the demand for the use of satellites operating in the 3700-4200 MHz band is decreasing". This may be true, but we note the use of higher frequencies primarily consists of direct-to-home, channel distribution to MVPDs, and news contribution from location. For example, Corus uses Ku band for news-gathering and as a redundancy for the delivery of programming to remote over-the-air transmitters.

However, C-band remains a primary source of news and programming contribution for North American studios to Canadian broadcasters. C-band provides Canadian broadcasters with high resiliency that cannot be replicated in bands higher than 10GHz, which suffer greater susceptibility to signal degradation from heavy snow and rain.

***** End of Document *****



¹⁷ [https://www.ic.gc.ca/eic/site/smt-gst.nsf/vwapj/Telesat_Proposal_July_5_2020_EN.pdf/\\$file/Telesat_Proposal_July_5_2020_EN.pdf](https://www.ic.gc.ca/eic/site/smt-gst.nsf/vwapj/Telesat_Proposal_July_5_2020_EN.pdf/$file/Telesat_Proposal_July_5_2020_EN.pdf), page 3