



COMMENTS OF TELESAT

In response to the TRAI consultation paper on
Assignment of Spectrum for Space-based Communication Services
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Laura Roberti
Director, Spectrum and Market Access
lroberti@telesat.com

Introduction

Telesat wishes to compliment TRAI for the extensive and well documented consultation covering fundamental aspects that will shape the future regulatory framework for satellite service provision in India.

Telesat also notes the open-minded approach in the consultation, with different options for spectrum allocation.

Telesat remains however puzzled by the consideration of a possible auction for satellite spectrum and wishes to highlight that, overall, the benefits to the country of such an option are not clear, while, on the other hand, the drawbacks are quite apparent.

Considering the spectrum sharing capabilities of satellite operators in microwave frequencies, Telesat is of the view that trying to design a suitable spectrum auction mechanism is like trying "to fit a round peg in a square hole".

Telesat is grateful for the opportunity to participate in this consultation and respectfully provides the replies below, with the focus on Ka-band.

Q1. For space-based communication services, what are the appropriate frequency bands for (a) gateway links and (b) user links, that should be considered under this consultation process for different types of licensed telecommunications and broadcasting services? Kindly justify your response with relevant details.

Telesat is planning to serve the Indian market with the novel Telesat Lightspeed LEO constellation. The spectrum to be used for the gateway and the user links is the same:

- 17.8-18.6GHz and 18.8-20.2GHz (space-to-Earth)¹
- 27.5-29.1GHz and 29.5-30GHz (Earth-to-space)

Planned Telesat Lightspeed services are not meant for direct sale to end users, but to local Service Providers and Network Operators for their enterprise, maritime, aeronautical and governmental applications, in compliance with local rules and regulations.

Q2. What quantum of spectrum for (a) gateway links and (b) user links in the appropriate frequency bands is required to meet the demand of space-based communication services? Information on present demand and likely demand after

¹ Telesat notes that, differently from what was indicated in §3.7, use of the 19.3-17.7GHz band in the FSS is not limited, at least at the level of Radio Regulations, only to GSO networks and feeder links of NGSO systems.

about five years may kindly be provided in two separate tables as per the proforma given below:

The entire spectrum indicated under Q1 is planned to be used for space-based communication services via Telesat Lightspeed constellation.

It is important to note that Telesat Lightspeed (and more in general the latest generation of satellite systems) will dynamically assign capacity to locations and routes with high demand. Such assignment of capacity entails varying the number and size of the satellite spot beams, as well as the amount of spectrum and power allocated to each beam. Dynamically reconfigurable beams, together with frequency reuse, result in a highly efficient use of satellite resources and spectrum.

In conclusion, for Telesat Lightspeed to make optimal use of the technical and operational system capabilities, flexible access to the entire spectrum would be required.

Q3. Whether there is any practical limit on the number of Non-Geo Stationary Orbit (NGSO) satellite systems in Low Earth Orbit (LEO) and Medium Earth Orbit (MEO), which can work in a coordinated manner on an equitable basis using the same frequency range? Kindly justify your response.

Any practical limit, if existing, may be determined only from the specific characteristics of the non-GSO systems involved. In other words, it is not possible to reply to this question with an answer that fits all possible cases.

Q4. For space-based communication services, whether frequency spectrum in higher bands such as C band, Ku band and Ka band, should be assigned to licensees on an exclusive basis? Kindly justify your response. Do you foresee any challenges due to exclusive assignment? If yes, in what manner can the challenges be overcome? Kindly elaborate the challenges and the ways to overcome them.

As already mentioned in other occasions by Telesat and, more in general, the satellite industry, satellite spectrum in higher frequency bands such as C, Ku and Ka can be naturally shared among multiple satellite operators and, therefore, should not be assigned on an exclusive basis.

Trying to do so would:

- contradict the basic and essential principle of efficient spectrum use, also imbedded in the ITU constitution;
- create artificial and unnecessary complications (some of which are already identified in §3.37-3.50);
- create anti-competitive and monopolistic conditions;

- be impossible to implement from a practical standpoint, as there are already multiple, well-established systems/networks operating in each of these bands;
- augment the price of satellite spectrum by artificially making it a scarce resource; and
- impede the normal sharing of spectrum among different satellite operators by
 - o limiting the spectrum available to each operator;
 - o creating gaps in service provision over India (in the case of spot beam coverage with fixed spectrum channel allocations, unless the operator manages to “win” all relevant spectrum channels);
 - o limiting the flexibility in spectrum use, linked to frequency reuse scheme and demand, which characterizes the most modern systems; and
 - o excluding some operators/service providers from the market entirely.

None of the above is ultimately beneficial to the customer and society more in general, bearing in mind that satellites services are meant to fill the gaps in terrestrial provision by reaching the unreachable and providing essential safety and security services.

Q5. In case it is decided to assign spectrum in higher frequency bands such as C band, Ku band and Ka band for space-based communication services to licensees on an exclusive basis, (a) What should be the block size, minimum number of blocks for bidding and spectrum cap per bidder? Response may be provided separately for each spectrum band.

(b) Whether intra-band sharing of frequency spectrum with other satellite communication service providers holding spectrum up to the prescribed spectrum cap, needs to be mandated?

(c) Whether a framework for mandatory spectrum sharing needs to be prescribed? If yes, kindly suggest a broad framework and the elements to be included in the guidelines.

(d) Any other suggestions to ensure that that the satellite communication ecosystem is not adversely impacted due to exclusive spectrum assignment, may kindly be made with detailed justification.

Kindly justify your response.

Telesat prefers not to contemplate this option, as, while having carefully considered the matter, Telesat cannot envisage a reasonable auction arrangement that would not potentially and artificially limit/preclude spectrum use for satellite operators.

Q6. What provisions should be made applicable on any new entrant or any entity who could not acquire spectrum in the auction process/assignment cycle?

(a) Whether such entity should take part in the next auction/ assignment cycle after expiry of the validity period of the assigned spectrum? If yes, what should be the validity period of the auctioned/assigned spectrum?

(b) Whether spectrum acquired through auction be permitted to be shared with any entity which does not hold spectrum/ or has not been successful in auction in the said band? If yes, what measures should be taken to ensure rationale of spectrum auction and to avoid adverse impact on the dynamics of the spectrum auction?

(c) In case an auction based on exclusive assignment is held in a spectrum band, whether the same spectrum may again be put to auction after certain number of years to any new entrant including the entities which could not acquire spectrum in the previous auction? If yes,

(i) After how many years the same spectrum band should be put to auction for the potential bidders?

(ii) What should be the validity of spectrum for the first conducted auction in a band? Whether the validity period for the subsequent auctions in that band should be co-terminus with the validity period of the first held auction?

Kindly justify your response.

The nature of Q6-Q8 further highlights the inherent contradictions implicit in opting for an auction process.

Given the imperative of efficient spectrum use, it is unjustifiable for an entity to be artificially excluded from using spectrum that could otherwise be shared. Any delay in accessing such spectrum would not only be counterproductive for such an entity (satellite operator and/or service provider), but also limit the choice for the end user, ultimately damaging the overall ecosystem.

If, on the other hand, spectrum acquired through auction is permitted to be shared with any entity which does not hold spectrum/ or has not been successful in the auction, then it defeats the purpose of having an auction in the first place.

Furthermore, an auction could create "super providers/spectrum holders" controlling access to the spectrum, and therefore the market, for other entities.

Finally, as another unnecessary complication, an auction process may lead to the paradox of current satellite service providers not being successful at the auction process and therefore having to interrupt already ongoing service provision.

Q7. Whether any entity which acquired the satellite spectrum through auction/assignment should be permitted to trade and/or lease their partial or entire satellite spectrum holding to other eligible service licensees, including the licensees which do not hold any spectrum in the concerned spectrum band? If yes, what measures should be taken to ensure rationale of spectrum auction and to

avoid adverse impact on the dynamics of the spectrum auction? Kindly justify your response.

See reply to Q6

Q8. For the existing service licensees providing space-based communication services, whether there is a need to create enabling provisions for assignment of the currently held spectrum frequency range by them, such that if the service licensee is successful in acquiring required quantum of spectrum through auction/ assignment cycle in the relevant band, its services are not disrupted? If yes, what

See reply to Q6

Q9. In case you are of the opinion that the frequency spectrum in higher frequency bands such as C band, Ku band and Ka band for space-based communication services should be assigned on shared (non-exclusive) basis, -

(a) Whether a broad framework for sharing of frequency spectrum among satellite communication service providers needs to be prescribed or it should be left to mutual coordination? In case you are of the opinion that broad framework should be prescribed, kindly suggest the framework and elements to be included in such a framework.

(b) Any other suggestions may kindly be made with detailed justification. Kindly justify your response.

Telesat (and the satellite industry more in general) is of the opinion that the spectrum in higher frequency bands, such as C, Ku and Ka, for space-based communication services should be assigned on a shared (non-exclusive) basis.

Spectrum sharing among satellite operators is an international matter and should be based on the provisions contained in the Radio Regulations.

- Coexistence between GSO networks is based on either a sufficient angular separation on the GSO arc or on coordination.
- Coexistence between NGSO systems and GSO networks is ensured, as also well described in the text of the consultation, either via compliance with Article 22 limits or coordination, depending on the frequency bands.
- Coexistence between NGSO systems is established by bi-lateral coordination discussions in which analysis are carried out by the different operators, taking into account the relevant provisions of the ITU Radio Regulations. Telesat would also like to highlight that there is absolutely no evidence that large distances may be required between NGSO gateways in order for them to coexist. The imposition of rigid pre-determined requirements may not be conducive to an optimal utilization of resources and could also result in artificial barriers to entry for newer satellite operators through elimination of suitable locations in siting of their gateways in India. Moreover, these

pre-determined requirements would need regular periodic review to ensure its relevancy as satellite technology evolves over the years. This eventually leads to unnecessary additional overheads and longer lead time for DoT/TRAI in the implementation of these changes. Overall, coexistence depends on various factors, including the agreed interference criterion and the technical characteristics of the NGSO systems involved. As such, it is better left to the satellite operators as part of the overall system coordination.

In general, Telesat is of the view that the ITU framework to manage satellite filings is efficient in terms of managing coordination between satellite systems/networks and providing a mechanism for resolving interference issues. A regulatory framework based on applying the ITU Radio Regulations provides satellite operators with the regulatory certainty critical to support the investment of billions of dollars to design, manufacture and deploy satellite systems/networks. Satellite services require a consistent global regulatory approach rather than a patchwork of domestic implementations.

Any national or regional initiative that would deviate from that framework would undermine the stability that the ITU Radio Regulations have provided to operators and the international community for decades together with the investments made and technological innovations provided, ultimately damaging citizens and consumers.

Q10. In the frequency range 27.5-28.5 GHz, whether the spectrum assignee should be permitted to utilize the frequency spectrum for IMT services as well as space-based communication services, in a flexible manner? Do you foresee any challenges arising out of such flexible use? If yes, in what manner can the challenges be overcome? Kindly elaborate the challenges and the ways to overcome them.

As a preliminary consideration, Telesat (and more in general the satellite industry) opposes possible IMT use in the 27.5-28.5GHz band.

Global trends do not support the auction of the 28 GHz band for IMT use. In fact, with very few exceptions (such as the USA, South Korea, Japan), this band has not been auctioned for terrestrial mobile use. Even in the few countries where this has occurred, the speed and extension of 5G deployment in the 28GHz band have been very disappointing. It is also clear that use of this spectrum for IMT is expected to be sparse and highly localized and does not support traditional wide-area spectrum licensing.

In the USA, the 28GHz deployment experience does not support widespread auction of these frequencies. Rogers² states that the *"U.S. mmWave deployments have not delivered on their early promise"* and that *"new mmWave deployments will be limited"* as carriers focus their 5G deployments on low and mid-band spectrum.

² Rogers Comments, Figure 1, page 13; Viasat Comments, 6 September 2022, page 6.

According to FCC Chairwoman Jessica Rosenworcel³, the FCC made a mistake when it focused all of its energy in the early 5G days on millimetre wave: "*If we just relied on millimeter wave spectrum, we'd actually grow the digital divide with 5G,*" she said. "*The good news is in the last year and the last several months, we really recognized that we have to pivot from millimeter wave spectrum to midband spectrum.*"

Overall, Telesat does not think the USA model is a good one for India to follow, given the latest developments in the market. The USA model was established at a time of great optimism about the potential for moderate wide area microwave deployment. In part owing to uncertainty about the availability of C-band spectrum in the USA, Verizon and AT&T announced ambitious plans for city-wide deployment of microwave spectrum. In reality, USA microwave deployments have not delivered on their early promise, and operators and handset manufacturers have now stepped back from their investment plans and the deployment has been limited to few urban centers. There is now expected to be a lengthy pause in which new microwave deployments will be limited, and the role of microwave in carrying data traffic actually diminishes as deployments of C-band spectrum gain ground.

The situation is even worse in South Korea, where the Government has canceled the spectrum that was allocated to local telcos in the 2018 auction for their 5G deployment, citing their lack of investment in the sector⁴.

South Korea is now planning to award 28 GHz spectrum to new entrants⁵, but the Ministry acknowledged that there are still uncertainties over the outlook of the market. Furthermore "*The Ministry will actively look for a new operator to use one of the two canceled spectrums. Considering that it might be hard to find an operator making new investments in 28GHz amidst economic uncertainties at home and abroad, the Ministry will prepare various measures to give practical support*". In other words, the business plan for 5G in 28GHz is not self-sustainable and needs governmental support.

Overall, it is now abundantly clear that it is not in the public interest to jeopardize satellite investment and services in the 28GHz band when terrestrial operators have limited foreseeable requirements for microwave spectrum which can be also satisfied by the 26 and 38 GHz bands.

In any case, given the limited geographical extension of possible IMT deployments in 28GHz, flexible use (to be used either for IMT or satellite) under an exclusive spectrum allocation on

³ See Axios interview, Acting FCC chair says 5G midband spectrum key to closing digital divide (16 July 2021), <https://www.axios.com/fcc-5g-midband-milimeter-spectrum-digital-divide-ee591e73-53be-4cf9-8818-f43bdb8d1976.html>.

⁴ South Korea cancels 5G 28GHz spectrum allocation to telcos due to 'lack of spending' | ZDNET

⁵ <https://www.msit.go.kr/eng/bbs/view.do?sCode=eng&mId=4&mPid=2&pageIndex=&bbsSeqNo=42&nttSeqNo=753&searchOpt=ALL&searchTxt=28ghz>

South Korea plans to award 28 GHz spectrum to new entrant (rcrwireless.com)

<https://www.lightreading.com/5g/korean-govt-falls-for-5g-fallacy-over-28ghz/d-d-id/783031>

a country-wide basis would not be a sensible way forward. It would once again imply an unnecessary "exclusivity" for spectrum that can be easily shared between satellite operators. Furthermore, given the costs normally associated with exclusive terrestrial mobile spectrum, only terrestrial mobile operators would realistically be able to participate in such an auction, automatically relegating satellite operators/service providers to a secondary position of dependency from terrestrial mobile operators for the use of spectrum.

Q11. In case it is decided to permit flexible use in the frequency range of 27.5 - 28.5 GHz for space-based communication services and IMT services, what should be the associated terms and conditions including eligibility conditions for such assignment of spectrum? Kindly justify your response.

As mentioned in the reply to Q10, Telesat is of the view that flexible use of spectrum on a nation-wide basis is not a sensible way forward.

Q12. Whether there is a requirement for permitting flexible use between CNPN and space-based communication services in the frequency range 28.5-29.5 GHz? Kindly justify your response.

Telesat and, more in general, the satellite industry have highlighted in several occasions the paramount importance of the 28GHz band for satellite services.

Telesat believes that CNPN, if allowed at all, should be authorized on a purely non-interference/non-protection basis, following also the example of the Kingdom of Saudi Arabia⁶.

Q13. Do you foresee any challenges in case the spectrum assignee is permitted to utilize the frequency spectrum in the range 28.5-29.5 GHz for cellular based CNPN as well as space-based communication services, in a flexible manner? What could be the measures to mitigate such challenges? Suggestions may kindly be made with justification.

As for Q10-Q11, permitting such flexible use to a spectrum assignee would:

- "mix" two completely different types of services in a single license;
- artificially limit the number of satellite operators being able to access this key portion of the spectrum;
- undoubtedly favor the terrestrial operators who have significantly larger financial means when participating to an auction and, therefore, put satellite operators in a position of dependency.

Q14. Whether space-based communication services should be categorized into different classes of services requiring different treatment for spectrum

⁶ <https://www.cst.gov.sa/en/ntn/Pages/SpectrumOutlookForCommercialAndInnovativeUse.aspx>

assignment? If yes, what should be the classification of services and which type of services should fall under each class of service? Kindly justify your response.

The current categorization in the Unified License framework may in general need revising as it is not necessarily reflective of the latest technological development and, to some extent, service convergence.

In any case, all spectrum for space-based communication services should be assigned administratively and the spectrum use for gateway links should be treated differently than for user links.

A further categorization of user links could be based on the requirement for coordination with terrestrial services (e.g. fixed earth stations used for backhaul purposes as opposed to smaller user terminals used for connectivity, such as ubiquitous VSATs or ESIMs – the former need individual licenses, while the latter can be adequately covered by a “blanket license”).

Q15. What should be the methodology for assignment of spectrum for user links for space-based communication services in L-band and S-band, such as-

(a) Auction-based

(b) Administrative

(c) Any other?

Please provide your response with detailed justification.

While these lower frequency bands do indeed require exclusive use also for satellite service provision, Telesat notes that, depending on the application (e.g. safety and security service, air-to-ground), global or at least regional harmonization of spectrum may be required, which is not well served by domestic auction processes.

Q16. What should be the methodology for assignment of spectrum for user links for space-based communication services in higher spectrum bands like C-band, Ku-band and Ka-band, such as

(a) Auction-based

(b) Administrative

(c) Any other?

Please provide your response in respect of different types of services (as mentioned in Table 1.3 of this consultation paper). Please support your response with detailed justification.

The methodology for assignment should be strictly administrative.

This is the only way to:

- allow for the usual sharing of spectrum among operators;
- ensure an efficient spectrum use;
- not impose any artificial limit to the number of operators servicing the Indian market;

- guarantee the best choice and service provision to Indian consumers; and
- avoid anti-competitive and monopolistic situations.

The purported analogy between terrestrial access spectrum and the satellite one is unfounded, as the two services, while both providing connectivity, are intrinsically different in the physics of the link (i.e. sharing feasibility) and in the economic and societal aspects. While terrestrial mobile is a service reaching billions of customers with corresponding revenues, satellite service provision is, in comparison, a niche, but indispensable, market filling in the gaps in terrestrial service provision to guarantee safety, connectivity and equal opportunity. There are orders of magnitude of difference in terms of the number of customers and revenue. As such, the idea of equating spectrum pricing between the two types of service is nonsensical.

Q17. Whether spectrum for user links should be assigned at the national level, or telecom circle/ metro-wise? Kindly justify your response.

The satellite spectrum should be assigned administratively at national level, as VSATs and especially ESIM deployment can be ubiquitous.

Q18. In case it is decided to auction user link frequency spectrum for different types of services, should separate auctions be conducted for each type of services? Kindly justify your response with detailed methodology.

In relation to satellite spectrum, an auction based on type of satellite services would add an additional degree of confusion and unsustainability, as an entity would potentially have to participate in multiple auctions for the same spectrum. This would further remove flexibility for possible transitions from one service provision to another.

Q19. What should be the methodology for assignment of spectrum for gateway links for space-based communication services, such as

- (a) Auction-based**
- (b) Administrative**
- (c) Any other?**

Please provide your response in respect of different types of services. Please support your response with detailed justification.

Assignment of spectrum for gateway links for space-based communication services should be on a purely administrative basis.

Multiple gateways of GSO systems using the same spectrum can coexist in the same location, thanks to the angular separation, as it is the case in the various teleports around the world.

Coexistence between NGSO gateways can also be ensured by taking into account the agreed interference criterion and the technical characteristics of the systems involved, as part of the overall system coordination. As already mentioned in the reply to Q9, there is no evidence that large distances may be required between NGSO gateways in order for them to coexist.

Overall, it is surprising that an auction process, which inevitably leads to limitations/exclusions, would even be considered. This is especially contradictory in a country like India that requires an in-country gateway. In other words, failure to “win gateway spectrum” at an auction would lead, amongst the several other complications, to the impossibility to comply with regulatory requirements.

Q20. In case it is decided to auction gateway link frequency spectrum for different types of services, should separate auctions be conducted for each type of services? Kindly justify your response with detailed methodology.

Please see replies to Q18 and Q19.

Q21. In case it is decided to assign frequency spectrum for space-based communication services through auction,

(a) What should be the validity period of the auctioned spectrum?

(b) What should be the periodicity of the auction for any unsold/ available spectrum?

(c) Whether some mechanism needs to be put in place to permit the service licensee to shift to another satellite system and to change the frequency spectrum within a frequency band (such as Ka-band, Ku-band, etc.) or across frequency bands for the remaining validity period of the spectrum held by it? If yes, what process should be adopted and whether some fee should be charged for this purpose?

Kindly justify your response.

Telesat does not support auctioning of space-based spectrum, due to the inherent difficulties it presents.

Q22. Considering that (a) space-based communication services require spectrum in both user link as well as gateway link, (b) use of frequency spectrum for different types of links may be different for different satellite systems, and (c) requirement of frequency spectrum may also vary depending on the services being envisaged to be provided, which of the following would be appropriate:

(i) to assign spectrum for gateway links and user links separately to give flexibility to the stakeholders? In case your response is in the affirmative, what mechanism should be adopted such that the successful bidder gets spectrum for user links as well as gateway links.

(ii) to assign spectrum for gateway links and user links in a bundled manner, such that the successful bidder gets spectrum for user link as well as gateway link? In case your response is in the affirmative, kindly suggest appropriate assignment methodology, including auction so that the successful bidder gets spectrum for user links as well as gateway links.

Spectrum should be assigned administratively and separately for user links and gateway links because

- the gateway operator may not necessarily be the same entity as the service provider
- the spectrum may not be the same

Q23. Whether any protection distance would be required around the satellite earth station gateway to avoid interference from other satellite earth station gateways for GSO/ NGSO satellites using the same frequency band? If yes, what would be the protection distance (radius) for the protection zone for GSO/ NGSO satellites?

As mentioned in the replies to Q9 and Q19, this matter is better left to satellite operators in the context of the coordination process, as this is entirely dependent on the specific characteristics of the different gateways/systems/networks. In other words, no specific minimum distance should be predetermined.

Q24. What should be the eligibility conditions for assignment of spectrum for each type of space-based communication service (as mentioned in the Table 1.3 of this Consultation Paper)?

Among other things, please provide your inputs with respect to the following eligibility conditions:

(a) Minimum Net Worth

(b) Requirement of existing agreement with satellite operator(s)

(c) Requirement of holding license/ authorization under Unified License prior to taking part in the auction process.

Kindly justify your response

Telesat prefers not to contemplate this possibility linked to spectrum auction.

Q25. What should be the terms and conditions for assignment of frequency spectrum for both user links as well as gateway links for each type of space-based communication service? Among other things, please provide your detailed inputs with respect to roll-out obligations on space-based communication service providers. Kindly provide response for both scenarios viz. exclusive assignment and non-exclusive (shared) assignment with justification.

Telesat reply refers to non-exclusive administrative assignment (i.e. no auction):

- Duration of the licence should be reasonably long, in order to give sufficient confidence and stability to the operators, especially considering that the deployment of an in-country gateway is also required. Telesat suggests a 10 year period, with the possibility of annual renewal.

- It does not make sense to introduce the concept of “roll out” obligations in relation to satellite services, unless the Government is subsidizing such deployment. In fact, differently from terrestrial mobile operator who need exclusive assignments, the spectrum denial of a satellite operator with respect to other satellite operators is negligible and is exclusively dependent on coordination conditions. Also, satellite operators’ commitment towards providing services is already supported by the deployment of an in-country gateway. In any case, satellite connectivity service provision is, by definition, a more niche market aimed at the important role of filling the gaps in terrestrial service for a more equitable digital society and for users on ships/aircraft.

Q26. Whether the provisions contained in the Chapter-VII (Spectrum Allotment and Use) of Unified License relating to restriction on crossholding of equity should also be made applicable for satellite-based service licensees? If yes, whether these provisions should be made applicable for each type of service separately? Kindly justify your response.

Restrictions on crossholding of equity would not seem applicable for satellite-based service licensees, as there is no need to hold any spectrum, given that the spectrum can be shared.

Q27. Keeping in view the provisions of ITU’s Radio Regulations on coexistence of terrestrial services and space-based communication services for sharing of same frequency range, do you foresee any challenges in ensuring interference-free operation of space-based communication network and terrestrial networks (i.e., microwave access (MWA) and microwave backbone (MWB) point to point links) using the same frequency range in the same geographical area? What could be the measures to mitigate such challenges? Suggestions may kindly be made with justification

There is no issue of sharing between fixed terrestrial services and satellite services in the 17.7-19.7GHz frequency bands:

- fixed earth stations can be individually coordinated;
- ubiquitous/mobile ones can operate on a non-protection basis (the probability of interference to ESIM is in any case very low); and
- Radio Regulations Article 21 limits ensures protection from space station transmission.

Q28. In what manner should the practice of assignment of a frequency range in two polarizations should be taken into account in the present exercise for assignment and valuation of spectrum? Kindly justify your response.

Use of polarization should not be considered, as it’s purely a way to further increase spectrum efficiency by the satellite operators. Satellite systems in Ka-band typically use circular

polarization. Increased efficiency by using both Left Hand Circular and Right Hand Circular should be up to the satellite operator (similarly to using higher orders of modulation and coding). It has no impact on the spectrum usage/spectrum denial for other systems.

Q29. What could be the likely issues, that may arise, if the following auction design models (described in para 3.127 to 3.139) are implemented for assignment of spectrum for user links in higher bands (such as C band, Ku band and Ka band)?

a. Model #1: Exclusive spectrum assignment

b. Model#2: Auction design model based on non-exclusive spectrum assignment to only a limited number of bidders

What changes should be made in the above models to mitigate any possible issues, including ways and means to ensure competitive bidding? Response on each model may kindly be made with justification

It is explicitly mentioned in the consultation document that "*Thus, in order to reflect true value of satellite spectrum, the auction design/model should create some sort of scarcity in case where supply is non-rivalrous and shareable*".

This shows how the indicated "price discovery process" would be artificial and lead, rather than to the "true value" of satellite spectrum, to an inflated price, driven also by terrestrial mobile operators participating to the auction.

Furthermore, both design models lead to the exclusion of some operators which would need to enter into extensive negotiations with existing spectrum holders and/or wait years for another auction round before entering the market.

As already mentioned, artificial restrictions on the amount of spectrum usable by satellite operators will lead to inefficient use of available resources and possible gaps in the service provision.

Q30. In your opinion, which of the two models mentioned in Question 29 above, should be used? Kindly justify your response.

Neither. They are both clearly unsuitable for assigning a resource that can be shared and they unnecessarily complicate the spectrum assignment and use between operators.

With reference to § 3.118, satellite spectrum in microwave bands can indeed be considered like a "club good", but with the difference that, using the example of the cinema, while there are some "behavioral rules" apply in the movie theatre (e.g. coordination) the number of seats is not limited. What an auction would do, is to impose a limited number of seats, push the price up so that only some customers would be interested in acquiring a ticket and add complicated rules on "seats sharing/swapping" during the projection.

Q31. In case it is decided to assign spectrum for user links using model # 2 i.e., non-exclusive spectrum assignment to limited bidders ($n + \Delta$), then what should be

(a) the value of Δ , in case it is decided to conduct a combined auction for all services

(b) the values of Δ , in case it is decided to conduct separate auction for each type of service

Please provide detailed justification.

Telesat prefers not to contemplate this possibility.

Q32. Kindly suggest any other auction design model(s) for user links including the terms and conditions? Kindly provide a detailed response with justification as to how it will satisfy the requirement of fair auction i.e., market discovery of price.

Telesat cannot envisage any suitable auction design model.

Q33. What could be the likely issues, that may arise, if Option # 1: (Area specific assignment of gateway spectrum on administrative basis) is implemented for assignment of spectrum for gateway links? What changes could be made in the proposed option to mitigate any possible issues?

There are no issues linked to administrative assignment of spectrum for gateway links. This is the standard process successfully applied all over the world. On the other hand, the idea of a possible auction determined price for user links to be used as a basis for charging for spectrum for gateway links does not make sense. Spectrum for the gateway is to be used at a specific location (instead off on a nation-wide basis) by an entity that could be different from the one providing the user links (e.g. a teleport owner).

Q34. What could be the likely issues, that may arise, if Option # 2: Assignment of gateway spectrum through auction for identified areas/ regions/ districts is implemented for assignment of spectrum gateway links? What changes could be made in the proposed option to mitigate any possible issues? In what manner, areas/ regions/ districts should be identified?

The idea of auctioning spectrum for gateways simply defies logic. As Teleports around the world show, multiple antennas of different GSO satellite providers can coexist and operate in the same location. Even for NGSO systems, there is no evidence that large separation distances are required. Please see also reply to Q19.

Q35. In your view, which spectrum assignment option for gateway links should be implemented? Kindly justify your response.

Spectrum assignment for gateway links should be on an administrative basis for the reasons listed in replies to Q33 and Q34.

Q36. Kindly suggest any other auction design model(s) for gateway links including the terms and conditions? Kindly provide a detailed response with justification as to how it will satisfy the requirement of fair auction i.e., market discovery of price?

Telesat prefers not to contemplate this possibility.

Q37. Any other issues/suggestions relevant to the subject, may be submitted with proper explanation and justification.

NGSO gateways are comprised of multiple identical antennas operating with the same spectrum. While each antenna may be pointing at a different satellite at any one time, the envelope of operation of all the antennas is not significantly different from that of a single one. In such cases, there should be no additional fees for additional antennas on the same site, as they are virtually co-located, use the same spectrum, operate within the same satellite system and managed by the same licensee.

This principle has already been adopted by in most countries where NGSO gateways are being deployed.

Q38. In case it is decided for assignment of spectrum on administrative basis, what should be the spectrum charging mechanism for assignment of spectrum for space-based communications services

i. For User Link

ii. For Gateway Link

Please support your answer with detailed justification.

While there is internationally no doubt on the suitability of administrative assignment for satellite spectrum, the cost of spectrum can vary significantly from country to country. There is however a general tendency towards spectrum fee reduction (e.g. Australia, Canada, Colombia, Saudi Arabia), especially in microwave frequencies, also due to the recognition that modern satellite systems can use large amount of spectrum (e.g. around 4GHz in Ka-band). This was unforeseeable a few years ago, when some of the bandwidth related fees were set. Spectrum fees in Europe in Ka-band are mostly aimed at recovering administrative cost and spectrum is generally free to use for user terminal that do not require coordination (e.g. ubiquitous VSATs, ESIM). Gateway link spectrum fees are typically different from user links fees.

Also, it is now generally recognized (e.g. Australia, US, Canada, Japan, New Zealand, Colombia, Guatemala, Mexico, UAE, Nigeria) that authorization/license of ubiquitous VSATs and ESIM operation is very well suited by a "class" or "network" authorization/license (also referred to as "blanket" authorization/license), a license that authorizes a "family" of user terminals with given characteristics. In other words, there is no need for individual terminal-by-terminal authorization as, due to the ubiquitous nature of ESIM and portable VSATs, specific coordination for individual user terminals is neither possible nor necessary.

In the Indian context, considering that the main concern seems to be the discovery of the "true value of spectrum", Telesat is of the view that it is reasonable to use the already proposed 1% of the AGR. This is a good reflection of the true value of spectrum, as directly and uniquely link to the actual spectrum use in the country.

High spectrum fees should not be a disincentive to operators to efficiently/flexibly use spectrum and should not become an artificial barrier to entry.

Spectrum charges such as the ones in the formula involving the Royalty, R (in Rs.) = 35000 x B_s (B_s is the Bandwidth factor which is 1 for every 500 KHz band) would lead to exorbitant fees for High Throughput Satellites (HTS) in Ka-band that can flexibly and efficiently use up to approximately 4 GHz of spectrum (overall for uplink and downlink).

There is normally an individual license for the gateway earth station, inclusive of spectrum use, also as the earth station typically requires coordination with terrestrial systems in the band – e.g. point-to-point microwave links. The spectrum should be authorized separately to the gateway operator, which could be the satellite operator, a teleport owner or a service provider.

This differentiation between the gateway and the user link licenses allows:

- greater flexibility and an equal footing in the market for local service providers;
- optimization of resources, as the gateway function can be centralized and managed by a teleport operator.

This has already been highlighted also in the TRAI consultation on “Licensing Framework for Establishing Satellite Earth Station Gateway” of 2021.

Bearing in mind that the gateway is considered as an infrastructure, also to comply with Indian regulatory requirements, and involves significant upfront financial investment, spectrum cost should be reasonable and aimed at solely covering administrative costs. This fee could be fixed per each gateway or based on a reasonable bandwidth multiplying factor.

Q39. Should the auction determined prices of spectrum bands for IMT /5G services be used as a basis for valuation of space-based communication spectrum bands

i. For user link

ii. For gateway link

Please support your answer with detailed justification.

Absolutely not. Such an approach would make spectrum unaffordable for the satellite industry and restrict spectrum users to terrestrial mobile operators. They, in turn, would most likely insist for flexible use of spectrum, as satellite use alone would not justify the cost, further limiting the possibility of satellite service deployment in India.

As already mentioned in the reply to Q16, the economics of satellite and mobile service provision are completely different (orders of magnitude).

Q40. If response to the above question is yes, please specify the detailed methodology to be used in this regard?

Not applicable.

Q41. Whether the value of space-based communication spectrum bands

i. For user link

ii For gateway link

be derived by relating it to the value of other bands by using a spectral efficiency factor? If yes, with which spectrum bands should these bands be related to and what efficiency factor or formula should be used? Please support your response with detailed justification.

Telesat wishes to seek further clarification to this question. In any case, it seems to be related to a spectral efficiency factor available only with respect to IMT/5G.

Q42. In case of an auction, should the current method of levying spectrum fees/charges for satellite spectrum bands on formula basis/ AGR basis as followed by DoT, serve as a basis for the purpose of valuation of satellite spectrum

i. For user link

ii. For gateway link

If yes, please specify in detail what methodology may be used in this regard.

Telesat prefers not to contemplate this possibility.

Q43. Should revenue surplus model be used for the valuation of space-based spectrum bands

i. For user link

ii. For gateway link

Please support your answer with detailed justification

Revenue surplus model implies assumptions, and therefore uncertainty, on the possible revenue over 20 years. While this may make sense for an auction where spectrum is individually and exclusively assigned for a number of years, it is not necessary for administrative assignment. In the case of the latter, the fee is paid annually and the proposed linkage to 1% of the AGR not only ensures the "true value of spectrum", but also avoids the need for "guessing" entirely.

Q44. Whether international benchmarking by comparing the auction determined prices of countries where auctions have been concluded for space-based communication services, if any, be used for arriving at the value of space-based communication spectrum bands:

i. For user link

ii For gateway link

If yes, what methodology should be followed in this regard? Please give country-wise details of auctions including the spectrum band /quantity put to auction, quantity bid, reserve price, auction determined price etc. Please support your response with detailed justification.

There is no international benchmarking available that could be used for auctions for microwave satellite spectrum.

In any case, Telesat wishes to clarify the fees applicable in Canada for FSS mentioned in §4.16^{7,8}: the \$137.86 per megahertz (MHz) fees applies exclusively to spectrum use by the space segment of Canadian files systems/networks (\$ refers to Canadian Dollars). Further clarifications in the note⁹.

Q45. Should the international administrative spectrum charges/fees serve as a basis/technique for the purpose of valuation in the case of satellite spectrum bands

i. For user link

ii. For gateway link

Please give country-wise details of administrative price being charged for each spectrum band. Please specify in detail terms and conditions in this regard.

Spectrum fees can vary greatly from country to country. Several good examples of administrative pricing adopted in other countries could be used.

It is worth noting that the sharing possibility in satellite microwave bands is recognized by all regulators around the world together with the societal benefits of the services provided. As such, the international trend has been clearly in the direction of a general reduction of fees, especially for Ka-band. It is also worth noting that a blanket license approach is typically adopted for the user ubiquitous VSATs and ESIM (i.e. no need for individual terminal-by-terminal licenses). See also reply to Q38.

⁷ Notice No. SMSE-002-23 — Fee Order for Earth Stations (canada.ca)

⁸ [Decision on Updates to the Licensing and Fee Framework for Earth Stations and Space Stations in Canada](#)

⁹ For spectrum licences authorizing the use of radio frequencies by earth stations where individual site approvals are required, the annual fee payable is the total assigned spectrum multiplied by the base rate, \$/MHz, specified below for the assigned frequency band(s). For additional clarification, the fees will cover all earth station operating within the same system.

below or equal to 1 GHz: \$2,000/MHz
above 1 GHz and below or equal to 3.4 GHz: \$100/MHz
above 3.4 GHz and below or equal to 7.075 GHz: \$20/MHz
above 7.075 GHz and below or equal to 17.3 GHz: \$10/MHz
above 17.3 GHz and below or equal to 51.4 GHz: \$5/MHz
above 51.4 GHz: \$1/MHz

For spectrum licences authorizing the use of radio frequencies by generic earth stations for fixed earth stations, transportable earth stations, and ESIMs, the annual fee payable is the total assigned spectrum multiplied by **\$5/MHz** for the assigned frequency band(s). For additional clarification, this fee does not apply to each individual terminal, but covers all earth stations not needing individual site approval. For additional clarification, this is a blanket license regime.

Q46. If the answer to above question is yes, should the administrative spectrum charges/fees be normalized for cross country differences? If yes, please specify in detail the methodology to be used in this regard?

Telesat believes this is a virtually impossible exercise.

Q47. Apart from the approaches highlighted above which other valuation approaches can be adopted for the valuation of space-based communication spectrum bands? Please support your suggestions with detailed methodology, related assumptions and other relevant factors.

As mentioned in the reply to Q38, a spectrum fee for user links of the order of 1% AGR would seem a suitable valuation approach

Q48. Should the valuation arrived for spectrum for user link be used for valuation for spectrum for gateway links as well? Please justify.

No, it should not be used. The evaluation of spectrum price for gateway and user link is different, for a variety of reasons.

While gateways normally need coordination with terrestrial services at a single location and can be considered as an infrastructure deployment (i.e. not for service provision), user links can be deployed nationwide, typically don't need coordination with terrestrial services (e.g. ESIM and ubiquitous VSATs) and can be adequately covered under a blanket license. Also, a %AGR fee for the gateway link would not make sense, as the deployment of the gateway will not be directly linked to service provision, if the two licenses are separate.

Q49. If the answer to the above is no, what should be the basis for distinction as well as the methodology that may be used for arriving at the valuation of satellite spectrum for gateway links? Please provide detailed justification

As already mentioned in the reply to Q38, also bearing in mind that the gateway should be considered as infrastructure, also to comply with Indian regulatory requirements, and involves significant financial investment, spectrum cost should be reasonable and aimed at covering administrative costs. The fee could be fixed or based on a reasonable bandwidth multiplying factor.

Q50 to Q54 below refer to an auction process and Telesat prefers not to consider this possibility.

Q50. Whether the value arrived at by using any single valuation approach for a particular spectrum band should be taken as the appropriate value of that band? If yes, please suggest which single approach/ method should be used. Please support your answer with detailed justification.

Q51. In case your response to the above question is negative, will it be appropriate to take the average valuation (simple mean) of the valuations obtained through the different approaches attempted for valuation of a particular spectrum band, or some other approach like taking weighted mean, median etc. should be followed? Please support your answer with detailed justification.

Q52. Should the reserve price for spectrum for user link and gateway link be taken as 70% of the valuation of spectrum for shared as well as for exclusive assignment? If not, then what ratio should be adopted between the reserve price for the auction and the valuation of the spectrum in different spectrum bands in case of (i) exclusive (ii) shared assignment and why? Please support your answer with detailed justification.

Q53. If it is decided to conduct separate auctions for different class of services, should reserve price for the auction of spectrum for each service class be distinct? If yes, on what parameter basis such as revenue, subscriber base etc. this distinction be made? Please support your answer with detailed justification for each class of service.

Q54. In case of auction based and/or administrative assignment of spectrum, what should the payment terms and associated conditions for the assignment of spectrum for space-based communication services relating to:

- i. Upfront payment**
- ii. Moratorium period**
- iii. Total number of installments to recover deferred payments**
- iv. Rate of discount in respect of deferred payment and prepayment**

Please support your answer with detailed justification.