25 th October 2024

Shri Akhilesh Kumar Trivedi,

Advisor (Networks, Spectrum and Licensing)

Telecom Regulatory Authority of India,

World Trade Center, Tower-F, Nauroji Nagar,

New Delhi-110029.

Sub: Hughes Comments on the TRAI Consultation Paper on Terms and Conditions for the Assignment of Spectrum for Certain Satellite-Based Commercial Communication Services.

Ref: TRAI Consultation Paper No. 13/2024.

Dear Sir,

With reference to the above, please find enclosed our comments to the mentioned consultation paper.

We are hopeful and look forward to your positive consideration.

Thanking you,

Yours Truly,

VINOD KUMAR PANDITA
2024.10.25 19:03:31 +05'30'
Vinod Pandita
Sr. Director – Regulatory Affairs

PREAMBLE

At the outset Hughes would like to thank the Telecommunications Regulatory Authority of

India ("TRAI") for this important consultation paper on the "Terms and Conditions for the Assignment of Spectrum for Certain Satellite-Based Commercial Communication Services ".

Hughes Networks Systems, LLC (Hughes) and its affiliates (collectively "EchoStar") were among the earliest global communications companies to invest in the communications sector in India and have been leading in space-based communications services for decades.

Hughes Communications India Pvt. Limited (HCI) is a Joint Venture of Hughes Network Systems, LLC, the leading global provider of broadband satellite networks and services, and Bharti Airtel Limited, India's premier communications solutions provider.

Hughes India has a VSAT installation base of around 185,000 VSATs, with unmatched reach and scale, the company is the largest satellite service operator in India, well positioned amid the changing regulatory environment to serve the emerging connectivity requirements of business and government customers with an enhanced product portfolio and operational efficiencies.

Hughes India is providing VSAT Services (FSS, land Mobility (ESIM) and IFMC) to its B2B Customer under Commercial VSAT CUG Authorization, which including a full range of managed network services, for government offices and enterprises across segments like banking, aeronautical and maritime mobility, small to medium sized businesses, education, and telecom backhaul, retail, energy, education and government.

Hughes would like to continue serving the B2B market segment using GSO/ NGSO Satellites in future as well. The present approach of revenue share (Percentage of AGR) for Commercial VSAT CUG Services (FSS, land Mobility (ESIM) and IFMC) is charged at 4% of AGR for GSO satellites. The industry size is small for existing B2B services (FSS, land Mobility (ESIM) and IFMC), keeping in view that the spectrum charges should be sufficient to cover the administrative costs of the spectrum which amounts to a fraction of the revenues (0.3-0.4%) for commercial Satcom Services. Hence, we recommend that the percentage be decided accordingly with a ceiling/cap of 1% of the AGR based on the earlier TRAI Recommendations in 2005, 2017, 2020, and 2021 issued from time-to-time on different occasions on related matters to make the SUC as 1% of AGR for the commercial CUG VSAT, irrespective of the data rates for both GSO/ NGSO based B2B Services(FSS, land Mobility (ESIM) and IFMC FSS).

We submit our answers to the consultation and remain available to provide additional information.

Q1. Which frequency band(s)/ range(s) should be considered for the assignment to NGSO based Fixed Satellite Services for providing data communication and Internet service? Please provide a detailed response separately for the user link and feeder link.

Hughes Response:

The use of satellite communication services has been rapidly increasing over the years, and with the ever-growing demand for high-speed internet and wireless services, the allocation of satellite spectrum has become a crucial issue, the effective spectrum management becomes increasingly critical to ensure efficient and interference-free operations. The ongoing advancements in technology and increasing global investment in space will further expand these services, addressing both current challenges and future needs. These services are integral to various sectors, enhancing global communication, navigation, environmental monitoring, and scientific research.

The effective management of radio frequency spectrum is vital for the seamless operation of space-based services. India's satellite spectrum management policy is governed by several regulatory frameworks and guidelines, primarily aimed at ensuring efficient use of spectrum, minimizing interference, and promoting fair competition among operators.

Satellite services use various frequency bands and each band has a specific characteristics and applications. Each frequency band has its strengths and weaknesses, making them suitable for different applications. The choice of frequency depends on factors like required bandwidth, coverage area, environmental conditions, and specific use cases.

We suggest that the frequency ranges for assignment should largely be consistent to those assigned to the GSO Fixed Satellite Services in India, unless stated otherwise in the ITU Radio Regulations. This allows NGSO satellite constellations to have equal access to the satellite spectrum available in the provision of services as GSO satellites. In view of the above, the following frequency ranges for GSO/NGSO Fixed Satellite Service (FSS) should be considered for user and feeder links.

- C-Band - 4-8 GHz
    - VSATs use Ext C Band or India C Band - Uplink 6.725-7.025 GHz and Downlink 4.5-4.8 GHz
- Ku-Band - 10-15 GHz
    - 10.7-12.75 downlink and 13.75-14.5 GHz uplink bands are global bands
    - 12.75-13.25 uplink is a planned band for Region 3 as per ITU RR

- Ka-Band - 17-31 GHz
    - Uplink band 27.5 - 30 GHz used internationally by VSATs
    - Downlink band 17.7-20.2 GHz used internationally by VSATs
    - Military Ka Uplink 30-31 GHz - DoS uses portion of this band in GSAT satellites
    - Military Ka Downlink 20.2-21.2 GHz - DoS uses portion of this band in GSAT satellites
    - 27.5-29.5 GHz band has "co-primary" status with FS as per ITU RR
- Q/V band - 33-75 GHz
    - 5 GHz up/down is reserved for FSS usage with FS HAPS using a portion of the band on "co-primary" basis (47.2-47.5 GHz)
    - FSS Uplink bands - 47.2-50.2 GHz and 50.4 - 51.4 GHz
    - FSS Downlink bands - 37.5 - 42.5 GHz
    - As per recent RR updates, band is shareable between GSO/NGSO networks
    - Additional 1 GHz allocation was made through a resolution in WRC 2019 - 51.4-52.4 GHz

We further suggest that 27.5-28.5 GHz band should be exclusively allocated for satellite services. The allocation of the Ka-band spectrum has already been harmonized around the globe for Satellite Services, particularly for the ubiquitous FSS and Earth Stations in Motion (ESIM), while using the globally harmonized 26 GHz for IMT Services. The satellite industry needs long-term certainty regarding access to harmonised spectrum to ensure the necessary investment and continued development of existing and new satellite capabilities. It is therefore essential; the governmental policy and approach facilitate access to sufficient spectrum and adequately protect them from harmful interference from other spectrum users.

Q2. Which frequency band(s)/ range(s) should be considered for the assignment to GSO/ NGSO based Mobile Satellite Services for providing voice, text, data, and Internet service. Please provide a detailed response separately for the user link and feeder link.

Hughes Response:

The Mobile Satellite Service (MSS) typically operates in L and S frequency bands.

- L-Band (1-2 GHz) specific allocations as per Article 5 of the RR
- S-Band (2-4 GHz) specific allocations as per Article 5 of the RR

In addition to this MSS also uses other FSS bands like C, Ku, Ka and Q/V bands for communications with Gateway Earth Stations (Feeder Links). These frequency bands are regulated internationally, and specific allocations may vary by region.

Q3. What should be the maximum period of assignment of spectrum for-

a. NGSO based Fixed Satellite Services for providing data communication and Internet services, and

b. GSO/NGSO-based Mobile Satellite Services for providing voice, text, data, and Internet services?

Please provide a detailed response along with international practice in this regard.

Hughes Response:

We are in view that the period of validity of spectrum assignment for NGSO-based FSS and GSO/NGSO-based MSS should be 20 years in line with the period of validity of the service authorization, so that it provides sufficient certainty to service providers for recovery of their capital investments. Another reason for a longer period of validity would be since Satellite-based broadband services are, at present, in a nascent stage of development, and their business potential would emerge after some years of operations; the policy and regulatory environment should be stable and certain, to give investors sufficient confidence to plan and monetise their investments.

Q4. For assigning spectrum for NGSO-based communication services, whether every ITU filing should be treated as a separate satellite system? Please provide a detailed response along with international practice in this regard.

Hughes Response:

IN-SPACe has already formulated the Norms, Guidelines and Procedures for implementation of the Indian Space Policy 2023 in respect of Authorization of Space Activities (NGP). In our opinion, the detailed IN-SPACe guidelines on ITU filings would suffice NGSO satellites could be supported by several ITU satellite filings. A new satellite filing may be submitted when additional satellites are launched to augment the existing capacity of the existing NGSO filings. We suggest that every ITU filing should not be treated as a separate satellite system.

Q5. Whether the provisions of ITU-RR are sufficient to resolve interference related challenges and coordination issues? If not, what additional conditions should be prescribed while assigning frequency spectrum for –

a) NGSO based Fixed Satellite Services for providing data Communication and Internet services; and

b) GSO/ NGSO based Mobile Satellite Services for providing voice, text, data, and Internet services?

Please provide a detailed response along with international practice in this regard.

Hughes Response:

It is to be noted that Article 22 of the Radio Regulations addresses space services and defines hard limits with respect to equivalent power flux density (EPFD) in certain frequency bands to protect GSO Earth station and satellite receivers from the emissions of NGSO FSS networks, together with reference antenna patterns. Also, EIRP limits (as a function of off-axis angle) are also provided for earth stations operating in GSO-FSS networks in Ku- and Ka-band frequencies.

Furthermore, the algorithm specified by Recommendation ITU-R S.1503-4 (09/2023): Functional description to be used in developing software tools for determining conformity of non-geostationary-satellite orbit fixed-satellite system networks with limits contained in Article 22 of the Radio Regulations. This Recommendation provides a functional description of the software for use by the ITU-BR to conduct an examination of NGSO-FSS system notifications for their compliance with the validation limits specified in the Radio Regulations.

Thus, EPFD limits enshrined in Article 22 of RR as of now remain as a basis for the efficient shared use of the GSO/NGSO in certain ranges of the Ku and Ka band frequencies, wherein the NGSO systems now freely able to globally operate across without adversely affecting use of the GSO networks. Upholding these hard limits guarantees a stable and level playing field for all the stakeholders as well as help to maintain the delicate balance necessary to have a win-win situation in the satellite industry.

For frequency bands not subject to Article 22 epfd limits, the ITU-RR procedures provide a complete regulatory framework for coordination and interference resolution for GSO-GSO, NGSO-GSO and NGSO-NGSO situations, for both FSS and MSS. Therefore there is no need for additional domestic regulations to resolve interference related challenges and coordination issues.

In view of the above, Hughes India opines that the existing ITU-RR provisions, which are current international practice, are sufficient to resolve interference-related challenges and coordination issues.

Q6. For satellite earth station gateways of different satellite systems operating in the same frequency range, whether there is a need to prescribe a protection distance or any other measures to avoid interference from each other–

c) Between the gateways of GSO and NGSO systems; and
d) Between the gateways of NGSO systems?

If yes, please provide a detailed response along with international practice in this regard.

Hughes Response:

It is our understanding that the interference is unlikely to happen between two GSO earth stations and or between a GSO and a NGSO earth station due to extremely directional nature of GSO systems as well as strictly adhering to Article 22 of RR provisions. NGSO networks can be managed by the concerned satellite operators to coordinate, negotiate and implement mitigation measures to any interference. In this regard, the licensing process could include sufficient and workable measures to facilitate satellite operators' coordination by clearly defining the rights and responsibilities of each party. Since the number of antennas makes little difference to the interference environment and opportunities for others to use the same spectrum.

Q7. In case the spectrum assigned for satellite gateway links is also assigned to terrestrial networks such as Fixed Service, IMT etc., what protection distance or criterion should be included in the terms and conditions of the assignment of spectrum for satellite gateway links to avoid any interference to/ from terrestrial networks? Please provide a detailed response along with international practice in this regard.

Hughes Response:

Coordination with terrestrial networks operating in a co-primary status with satellite services, should be handled by the operators themselves based on ITU-R Recommendations. There is no need for additional domestic regulations to resolve interference related challenges and coordination issues.

Fixed Service and Gateways can be coordinated as both locations are known.

In the case of the 28 GHz, IMT was not identified in this band. However, similar terrestrial sharing studies was conducted by Task Group 5/1 for WRC-19 on the 26 GHz. The results

of the studies1 showed a possible separation distance of up to 10km between FSS earth station and IMT station.

While the sharing studies are solely based on the 26 GHz, it is expected for this separation distance to be lesser than those reflected in TG5/1 in the case of the higher attenuation of Radio Frequency signals in the 28 GHz.

Q8. In case the spectrum assigned to the satellite user link is also assigned to terrestrial networks such as Fixed Service, what criterion should be included in the terms and conditions of the assignment of spectrum for satellite user links to avoid any interference to/ from terrestrial networks? Please provide a detailed response along with international practice in this regard.

Hughes Response:

In the case of fixed VSATs, they can be individually coordinated with the FS.

For the case of ESIM, sharing conditions could be adopted from relevant resolutions from the outcomes of previous WRCs such as Res **123 (WRC-23)** and **Res 169 (WRC-19)** for the protection of terrestrial services in the Ka-band.

Q9. Whether there is a need to prescribe any conditions to mitigate the risk of scarcity of satellite gateway sites? If yes, please provide a detailed response along with international practice in this regard.

Hughes Response:

There should not be a need to prescribe any conditions to mitigate the risk of scarcity of satellite gateway sites.

There is no need for a predefined minimum distance as this should be determined between operator to define during the coordination process.

Newer NGSO satellite systems leverage on Optical Inter-Satellite Links that allow constellations to make efficient use of gateway earth stations by limiting their numbers.

Q10. In addition to the roll-out conditions recommended by TRAI for satellite-based Telecommunication Service Authorisation through its recommendations on the Framework for Service Authorisations to be Granted Under the Telecommunications Act, 2023 dated 18.09.2024, whether there is a need to impose certain additional roll-out obligations for the assignment of frequency spectrum for –

(c) NGSO-based Fixed Satellite Services for providing data communication and Internet services.

(d) GSO/ NGSO based Mobile Satellite Services for providing voice, text, data, and Internet services?

Please provide a detailed response along with international practice in this regard.

Hughes Response:

TRAI has already delineated explicit roll-out conditions in its Recommendations on the Framework for Service Authorisations to be Granted Under the Telecommunications Act, 2023 dated 18-09-2024. However, as an act of fair play, the roll-out obligations should invariably consider an exceptional circumstances (force majeure/act of God) clause to deal with situations beyond the control of the licensee.

Furthermore, the roll-out obligations are to be met within 18 or 24 months from the date of assignment of frequency assignment subject to issuance of relevant Authorization as well. Any delay in issuing administrative authorization should be taken into consideration for levying LD charges.

As such, we are of the view that there is no need to impose additional roll-out obligations for the assignment of frequency spectrum.

Q11.Whether there is a need to introduce a provision for surrender of frequency spectrum prior to the expiry of the period of validity of spectrum assigned for –

c) NGSO based Fixed Satellite Services for providing data communication and Internet services;

d) GSO/ NGSO based Mobile Satellite Services for providing voice, text, data, and Internet services?

If yes, what should be the process, and associated terms and conditions such as minimum period of spectrum holding, notice period, surrender fee, etc.? Please provide a detailed response with justifications.

Hughes Response:

It is not required to introduce such a provision. In case it is required the same can be decided on a case-by-case basis.

Q12. Whether there is a need to prescribe timelines for processing the applications for the assignment of frequency spectrum for-

(c) NGSO based Fixed Satellite Services for providing data communication and

Internet services;

(d) GSO/ NGSO based Mobile Satellite Services for providing voice, text, data, and Internet services?

Please provide a detailed response with justifications.

Hughes Response:

It is essential that spectrum assignment and allocation be made, preferably within 15 days of the application. Delay in the assignment of spectrum may result in non-utilization of precious satellite resources. Therefore, it is important that the frequency spectrum is assigned to the authorised entities within a reasonable timeframe of 15 days. TRAI recommendations on ease of doing business for Satcom issued in May 2023 may be kindly reiterated in this regard.

Q13. Whether there are any other suggestions related to assignment of spectrum for-

a) NGSO based Fixed Satellite Services for providing data communication and Internet services;

b) GSO/ NGSO based Mobile Satellite Services for providing voice, text, data, and Internet services?

Please provide a detailed response with justifications.

Hughes Response:

There should not be any unnecessary provisions or regulations related to the assignment of spectrum that could inevitably translate to higher operating costs for the use of GSO/NGSO satellites for providing data communication and internet services. More importantly, provisions relating to the assignment of spectrum should be rational, consistent, and equitable to that of GSO FSS.

Q14. Should spectrum charges for NGSO-based FSS providing data communication and Internet services, be levied:

i. On a per MHz basis
ii. On a percentage of Adjusted Gross Revenue (AGR) basis, or
iii. Through some other methodology?

Please provide a detailed justification for your answer.

Hughes Response:

The present approach of revenue share (Percentage of AGR) for Commercial VSAT Services is appropriate for India for the nascent space sector to grow. Keeping in view that spectrum

charges should be sufficient to cover the administrative costs of the spectrum which amounts to a fraction of the revenues (0.3-0.4%) for commercial Satcom , we recommend that the percentage be decided accordingly with a ceiling/cap of 1% of the AGR . This would be in consonance with the National priorities of Mainstreaming Satcom and that of Ease of Doing Business as enshrined in the core principles of Telecommunication.
In this context, it may be recalled that TRAI, vide its Recommendations in 2005, 2017, 2020, and 2021 issued from time-to-time on different occasions on related matters to make the SUC as 1% of AGR for the commercial CUG VSAT, irrespective of the data rate.

Q15. In case it is decided that spectrum charges for NGSO-based FSS providing data communication and Internet services should be levied on a per MHz basis, should these charges be calculated based on:

i. **The Department of Telecommunications (DoT) order dated December 11, 2023, or**

ii. **An alternative approach (please specify)?**

Please provide a detailed justification to support your answer.

Hughes Response:

We do not support MHz based charging mechanism. To illustrate further, the formula royalty applied to a 4 GHz spectrum will lead to 280 million Indian Rupees worth of fees. The current formula Royalty, R (in Rs.) = 35000 x Bs would lead to astronomical amounts in the case of bandwidth in the order of GHz. This fee is not sustainable for any satellite operator and this fee will be worse off for satellite operators operating in higher order frequency bands where the bandwidth is much larger.

Hence, we strongly suggest that it should be based on a Percentage of AGR. Keeping in view that spectrum charges should be sufficient to cover the administrative costs of spectrum which amounts to a fraction of the revenues (0.3-0.4%) for commercial Satcom we recommend that the percentage be decided accordingly with a ceiling/cap of 1% of the AGR. This would be in consonance with the National priorities of Mainstreaming Satcom and that of Ease of Doing Business as enshrined in the core principles of the Telecommunications Act 2023.

Q16. If it is decided that spectrum charges for NGSO-based FSS providing data communication and Internet services should be levied on a percentage of AGR basis:

i. **What should be the appropriate percentage of AGR?**

ii. **Should a minimum spectrum charge be specified to address the issue of inefficient utilization of spectrum? If yes, what methodology may be used to determine the amount of the minimum spectrum charge?**

iii. **Is there an alternative approach that could be followed to address the issue of inefficient spectrum utilization?**

Please provide a detailed justification for your answers.

Hughes Response:

We suggest that it should be based as a Percentage of AGR. Keeping in view that spectrum charges should be sufficient to cover the administrative costs of spectrum which amounts to a fraction of the revenues (0.3-0.4%) for commercial Satcom services. Accordingly, we recommend that the percentage be kept at 0.3-0.4%, with a ceiling/cap of 1% of the AGR. We also wish to request that Royalty Charges for VSAT based services under erstwhile NLD authorisation which was determined using a formula-based mechanism under the old WPC Order of 2012, be also merged in the new AGR methodology. This would be in consonance with the National priorities of Mainstreaming Satcom and that of Ease of Doing Business as enshrined in the core principles of the Telecommunications Act 2023. This would be also in consonance with the TRAI Recommendations of June 2021 for implementing 1% SUC for all Commercial VSAT & GMPCS Licenses. This has been the ask of the entire Satcom industry.

Q17. Considering the Adjusted Gross Revenue (AGR) based charging methodology currently followed for Commercial VSAT and in view of the enhanced scope of the Satellite service authorisation, what should be the spectrum charge, as a percentage of AGR, that should be levied on GSO-based FSS? Or,

Should some alternative spectrum charging methodology be used for determining spectrum charges for GSO-based FSS?

Please provide a detailed justification for your answer.

Hughes Response:

Hughes India is providing VSAT Services (FSS, land Mobility (ESIM) and IFMC) to its B2B Customer under Commercial CUG VSAT Authorization, which including a full range of managed network services, for government offices and enterprises across segments like banking, aeronautical and maritime mobility, small to medium sized businesses, education, and telecom backhaul, retail, energy, education and government.

Hughes would like to continue serving the B2B market segment using GSO/ NGSO Satellites in future as well. The present approach of revenue share (Percentage of AGR) for Commercial CUG VSAT Services (FSS, land Mobility (ESIM) and IFMC) is charged at 4% of AGR for GSO satellites. The industry size is small for existing B2B services (FSS, land Mobility (ESIM) and IFMC), keeping in view that the spectrum charges should be sufficient to cover the administrative costs of the spectrum which amounts to a fraction of the revenues (0.3-0.4%) for commercial Satcom Services. Hence, we recommend that the percentage be decided accordingly with a ceiling/cap of 1% of the AGR based on the earlier TRAI Recommendations in 2005, 2017, 2020, and 2021 issued from time-to-time on different occasions on related matters to make the SUC as 1% of AGR for the commercial CUG VSAT, irrespective of the data rates for both GSO/ NGSO based Services (FSS, land Mobility (ESIM) and IFMC FSS).

Q18. Should spectrum charges for GSO and NGSO-based MSS that provide voice, text, data, and Internet services be levied:

i. **On a per MHz basis,**

ii. **On a percentage of AGR basis, or**

iii. **Through some other methodology?**

Please provide a detailed justification for your answer.

Hughes Response:

It should be as a percentage of AGR basis and the same as GSO/NGSO-based FSS.

Q19. If it is determined that spectrum charges for GSO/NGSO-based MSS providing voice, text, data, and Internet services should be levied on a per MHz basis, should these charges be calculated based on:

i. **The Department of Telecommunications (DoT) order dated December 11, 2023, or**

ii. **An alternative approach (please specify)?**

Please provide a detailed justification to support your answer.

Hughes Response:

We are not in favour of it being on per MHz basis, it should be on AGR basis.

Q20. If it is decided that spectrum charges for GSO/NGSO-based MSS providing voice, text, data, and Internet services should be levied on a percentage of AGR basis:

i. **What should be the appropriate percentage?**

ii. **Should a minimum spectrum charge be specified to address the issue of inefficient utilization of spectrum? If yes, what methodology may be used to determine the amount of the minimum spectrum charge?**

iii. **Is there an alternative approach that could be followed to address the issue of inefficient spectrum utilization?**

Please provide a detailed justification for your answers.

Hughes Response:

It should be 1% of AGR as per conscious and consistent stand of TRAI in previous occasions on the issue.

Q21. Whether there are any other issues/suggestions relevant to the spectrum charging for:

i. **NGSO/GSO based FSS providing data communication and Internet services.**

ii. **NGSO/GSO based MSS providing voice, text, data, and Internet services.**

The response may be submitted with proper explanation and justification.

Hughes Response:

No Comments