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New Delhi - 110002

**Subject: USIBC submission in response to TRAI Consultation Paper No. 6/2023 –  
Assignment of Spectrum for Space-based Communication Services.**

Dear Shri Akhilesh Kumar Trivedi,

Since our inception in 1975, the U.S.-India Business Council (USIBC) has tirelessly promoted an inclusive bilateral trade environment between India and the United States and consistently advocates for a strong, strategic bilateral relationship in support of entrepreneurship, job creation and economic growth. Among other things, we engage in stakeholder dialogues to ensure that India's economic growth flourishes based on light-touch regulation and international best practices. USIBC is an integral part of the U.S. Chamber of Commerce, the world's largest business advocacy organization, operating in over fifty countries to promote free enterprise and advance trade and investment. USIBC encourages a broad set of digital policies that encourage bilateral trade and commerce, thereby creating a transparent and attractive investment environment, and the general ease of doing business.

USIBC represents about 200 companies of every size from multiple sectors based in India, the U.S., and like-minded nations. USIBC members include broadcasters, telecom operators, equipment manufacturers, systems integrations, and companies reliant on secure, trusted, and efficient global communications networks. Our members also include e-commerce, sharing economy, and other digital enterprises, as well as the technology service providers and product producers that support and enable India's rapidly expanding digital economy and telecom manufacturing sectors. **Specifically, USIBC has about a dozen member companies involved in commercial space, including several dedicated satellite communications (satcom) companies, as well as a broad set of satcom users from the telecom, defense, industrial sectors, et al.**

USIBC has a long history of working with TRAI and the Indian Government. We hosted the TRAI Secretary at our India Ideas Summit in New Delhi, in September 2022, and regularly engage the Authority in support of telecommunications policy, sound regulations, and the development of the sector, including on fraud prevention, 5G spectrum auctions and implementation, satellite communications, and other critical and strategic technologies. As a key industry stakeholder in the Indo-U.S. Initiative on Critical and Emerging Technologies (iCET), we actively promote strategies for long-term, multi-stakeholder bilateral cooperation in the space and satellite communication sectors. During the iCET in January, we hosted the Indian Space Research Organisation (ISRO) Chair and his senior leadership, and in late 2022 hosted the Minister of Space during his U.S. visit. This month, we led the Advance Telecom Working Group in Washington DC as part of the U.S.-India Information and Communications Technology Working Group (ICTWG) co-chaired by the MeitY Secretary with Department of Telecommunications (DoT) support. **Thus, USIBC is a trusted partner that promotes a vibrant Indian telecommunications sector – from services and manufacturing to enabling a dynamic commercial space ecosystem.**



**We write today to share our comments to the TRAI's on Assignment of Spectrum for Space-based Communication Services (No. 6/2023), issued on 6th April 2023.**

At the outset, USIBC would like to note that the TRAI consultation paper is comprehensive and informative. The assignment of spectrum for space-based communication services is timely as it closely preceded India's New Space Policy. Given the vitality of space-based communications to the Indian broadcasting, video and media industries, we wish to express the following views on behalf of our industry membership.

Satcom has clear value to a broad set of users and drives technological innovation based on long-standing international norms that administer spectrum via a recognized process of allocation on a non-exclusive basis based predicated on non-interference. **While USIBC supports spectrum auctions as one important way to allocate spectrum, USIBC opposes the auctioning of spectrum for space-based satellite communications and strongly advocates that India utilized international norms and processes that administratively assignment spectrum for space-based satellite communication services.** The rationale of this position is based on:

**Satcom economics:** Satcom services provide a unique value to the society, including cost-effective and ubiquitous coverage of rural areas, difficult terrain, and maritime territories. These connections are central the Prime Minister's *Digital India* vision. The use of auctions for satcom services will raise prices, reduce investment, and limit the availability of these services to the rural population and industrial users such as extractive services and the blue economy.

**Universal Service and Access:** India has a large section of rural population which may best be served with satellite backhaul for 5G telephony services, as it may not be pragmatic or financially viable to do so via the terrestrial network architecture. Thus, progress and advances in satellite communication technology can play a major role in programs such as Gol's eGovernance vision and connectivity for financial inclusion, health, and other programs grounded on connectivity.

**Non-exclusivity:** Spectrum auctions assign exclusive rights of access where the winning bidder pays a premium to acquire exclusive access. With satcom, however, the exclusive assignment of satellite spectrum to a single entity would have multiple and specific negative impacts that should—and can—be avoided altogether. In fact, auctioning spectrum for satellite services will impose an artificial restriction on the effective sharing mechanism that is the global norm in the satellite industry. Satellite technology allows multiple satellite operators to share the same spectrum, and interference among different networks can be resolved effectively through well-tested frequency coordination mechanisms. Non-exclusive use of spectrum by satellite communications providers promotes spectral efficiency and the availability of satellite communications for the benefit of users throughout the coverage area..

**Band Fragmentation:** If auctioned, satellite spectrum may be separated into sub-optimal frequency blocks to bidders on an exclusive basis. This may result in the fragmentation of the bands that are now shared by all satellite services and may be an inefficient way of utilizing the shared limited resource of satellite spectrum. To further stress on this point, it may be recalled that the Supreme Court of India remarked "*Auction may be the best way of maximising revenue, but revenue maximisation may not always be the best way to serve the public good.*" The Court also held that auctioning is not mandated by Art. 14 of India's Constitution.



**International Norms:** There is a long-standing process managed by national jurisdictions and the International Telecommunication Union (ITU) that has supported the development of a satcom industry. This system works and has helped promote a global sector valued at approximately one hundred billion dollars.<sup>1</sup> The TRAI proposal undermines this process and will inhibit Indian industry from benefiting from the sectors economic and societal benefits.

TRAI also acknowledged this fact in para 3.122 of the Consultation Paper noting that countries like the U.S. and Brazil, that tried auctioning have reverted to administrative allocation.

*“3.122 On examination of the international experience on auction of spectrum for space-based communication services, it has been observed that a few countries, such as USA, Brazil and Saudi Arabia, have conducted auctions for frequency spectrum in the past. USA and Brazil conducted auction of satellite spectrum along with orbital slots. However, both the countries have reverted to administrative assignment. Saudi Arabia recently conducted auction of spectrum in S-band. Since the technical characteristics of S-band are such that it is assigned on exclusive basis for MSS, auction can be conducted in a manner similar to the spectrum auction for terrestrial mobile services. Therefore, it can be inferred that internationally, there is no design model available for auction of the frequency spectrum in higher frequency bands such as C-band, Ku band, and Ka band, which are sharable among multiple service providers.”*

*3.123 In view of the above, there may be a need to look for new methods to assign frequency spectrum for space-based communication services. The Authority is undertaking the exercise for assignment of spectrum for space-based communication services through a market mechanism for the first time and there is no international experience in auction of space spectrum on the matter except few cases where orbital slots along with spectrum have been auctioned.”  
(Underlined for emphasis)*

**Barriers to entry:** As satellite spectrum is non-rivalrous in nature, i.e., multiple satellite operators can use the same spectrum without diminishing the availability of that spectrum for others. When a resource has such characteristics and can be used in this manner, auctioning satellite spectrum is inefficient, exclusionary, and hence anti-competitive. For example, in the broadcast and cable services , administrative allocation allows the C-Band to be shared between 350 broadcasters and more than 1,700 distribution platform operators (DPOs) for channel uplink and downlink. If this were to be auctioned, many of these broadcasters and DPOs would not have the resources to acquire the necessary spectrum. Hence auctioning creates entry barriers to the market for spectrum and many small broadcasters who are currently in the market would be deprived of the opportunity to broadcast their channels.

This would hinder distribution of content, potentially violating the freedom of speech and expression of broadcasters, as the right to propagate ideas (say, in the form of TV channels) has been recognised by the Supreme Court<sup>2</sup> as being part of the right to free speech and expression. Additionally, the Supreme Court held<sup>3</sup> that there could not be any restriction on the freedom of speech and expression on the grounds of public interest, or on any grounds other than those mentioned in Article 19 (2) of the

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<sup>1</sup> Satellite Industry Association, SIA Releases 25th Annual State of the Satellite Industry Report, June 2022, ([Link](#)).

<sup>2</sup> *Sakal Newspapers v. Union of India* (1962 AIR 305).

<sup>3</sup> *Indian Express Newspaper v. Union of India* (1985 SCR (2) 287).



Indian Constitution. Furthermore, the Supreme Court in the 1995 'Airwaves Judgement'<sup>4</sup> held that *"Airwaves being public property, it is the duty of the State to see that airwaves are so utilised as to advance the free speech right of the citizens which is served by **ensuring plurality and diversity of views, opinions and ideas.**"* (Emphasis added).

**Auctioning of satellite spectrum is not in public interest, doing it so will lead to market failure:** As previously cited, auctioning of satellite spectrum is not in public interest. Even the Supreme Court, in the Presidential Reference<sup>5</sup> to the 2G spectrum judgement (a judgement on terrestrial spectrum that us assigned on an exclusive basis), emphasised that *"Auction may be the best way of maximising revenue, but revenue maximisation may not always be the best way to serve public good."* Drawing from this judgement and the fact that satellite spectrum can be shared amongst multiple service providers without diminishing what is available to others, administrative allocation is a one viable way to achieve this objective.

For the reasons outlined above, USIBC opposes the auctioning of the spectrum for space-based communication services and suggests the administrative assignment of spectrum, which is a standard practice globally for space-based communication services. We have also provided response to specific question as an appendix. Should you have any enquiries, please do not hesitate to contact me or my staff: Sameer Guduru, [sguduru@usibc.com](mailto:sguduru@usibc.com), USIBC's Director of Digital Economy and Satcom. USIBC is committed to enhancing commerce and investment between India and the United States and appreciates your attention in this matter.

Warm regards

Jay Gullish  
Executive Director  
United States - India Business Council

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<sup>4</sup> *Secretary, Ministry of Information and Broadcasting v. Cricket Association of Bengal 1995 (2) SCC (161).*

<sup>5</sup> *Special Reference No. 1 of 2012, [2012] 9 SCR 311.*



**Provided below are responses to some of the questions that TRAI posed in the CP:**

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

Space-based communications play a critical role in a variety of applications, including remote sensing, earth observation, weather forecasting, navigation, satellite television, broadband internet, and many others. In turn, different frequency bands and services have different characteristics that make them suitable for specific types of applications. For example, higher frequency bands, such as Ku-band, Ka-band and Q/V band frequencies, are ideal for broadband satellite communications because they offer high data rates, while lower frequency bands, such as L-band and S-band frequencies, are better suited for navigation and remote sensing applications because they penetrate through clouds and other objects. Therefore, it is important to have access to a diverse set of frequency bands and services that can support these applications.

Additionally, the demand for spectrum will only increase with the growing use of satellite-based services, so the availability of the maximum amount of spectrum possible can help meet this demand and ensure efficient use of resources while minimizing interference.

***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.***

While there may be a theoretical limit on the number of NGSO systems that can operate in a coordinated manner, such number is not static and would depend on various technical and regulatory factors, such as the frequency bands used, the satellite orbits, the power levels, the antenna beam widths, and the level of coordination among the various NGSO systems. Such theoretical limitation is not a determinant for the assessment the TRAI conducts in its Consultation Paper, as the frequency coordination among NGSO systems is typically conducted to avoid interference and to ensure efficient use of limited spectrum resources.

***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?***

We do not believe these bands can be assigned to licensees for space-based communications on an exclusive basis without resulting in the disruption of the Indian broadcasting industry in a major way. The current frequency allocation system for space-based communications is consistent with the existing ITU system of frequency coordination among countries and among companies. There is no existing international example of auctioning specific frequencies to licensees for space-based communications on an exclusive basis.

***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 mechanism should be prescribed? Kindly justify your response.***

As detailed in our general comments, the exclusive assignment of spectrum for the provision of satellite services to a single entity will have multiple and specific negative impacts that should - and can - be avoided altogether. The present set of questions assume that there is a need to artificially create scarcity and use auctions as a methodology, although it also recognizes the need to correct or subvert the main characteristics of such procedures. However, as thoroughly detailed in our general comments, the decision to auction spectrum for satellite-based communications is not mandated by court decisions or otherwise required under Indian law.

The methodology that should be used for spectrum assignment for satellite communications is the one that promotes, *ab initio*, that the spectrum is available to multiple entities, fosters competition, and leads to increased innovation, better quality of services, and more competitive prices. This will ultimately be the only method that benefits customers and promotes growth in India.

***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.***

The sharing of spectrum among various satellite operators/service providers is governed by Article 9 of the ITU Radio Regulations (RR). The RR provide detailed guidelines on the sharing and coordination of spectrum. We submit that the terms for sharing spectrum among satellite communications operators should be left to frequency coordination, and parties engaged in the coordination should be required to notify the Indian Administration before they can be licensed to operate in the country.

Thus, we believe the current internationally accepted system of assignment of satellite frequencies on a shared basis should be continued. We believe the current system relying on mutual coordination has worked satisfactorily and has made it possible for all countries to benefit from satellite technology. Breaking this system is not in Indian interest, neither may it serve others well.

***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.***

Flexible utilization of this spectrum in this manner may imply assignment of the spectrum on an exclusive basis. As noted above, we oppose fragmentation of the satellite spectrum and exclusive assignment of frequencies. The TRAI has rightly noted that use of this band for International Mobile Telecommunications (IMT) services will require exclusive spectrum, and this will foreclose all other (satellite) users.



***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.***

USIBC supports the use of this spectrum for technologically different services but the co-mingling of different services within smaller blocks of spectrum would likely cause challenges. While it may be possible to address some of these challenges (e.g., use of the 27.5-28.5 GHz band by both IMT and satellite gateway stations), such co-existence would inevitably deteriorate the quality of the communication operations and put undue constraints on either or both services. It is worth pointing out that it would be very difficult to coordinate IMT deployments and satellite user terminal deployments in the same frequency band. Thus, we submit that the actual need of these frequency bands for each service should be thoroughly assessed, namely, in the face of the current use and demand for spectrum already assigned (for example, in the case of IMT-based services and considering the result of the latest assignments).

As far as the flexible use of a frequency range for different services by the same operators, spectrum that is assigned either through auction or an administrative mechanism is assigned for a given service. The pricing of the spectrum considers the use of the spectrum by a particular service and does not envisage a flexible use case. So, it would be incorrect to determine the price and then apply the flexible sharing principle. In addition, such a proposed approach would create an imbalance where spectrum assigned for IMT (allowing flexible use) could be used for both gateway stations, Earth Stations in Motion (ESIM), and user terminal operations, whereas spectrum assigned for satellite use would be permitted only for gateway stations and ESIMs and not for user terminal use. We do not see a need for such flexible use, nor adequate technical solutions given the characteristics of each operation and would therefore deem it not possible.

Additionally, we note that the rollout of terrestrial mobile wireless services in the millimeter wave bands to date have been extremely poor:

- South Korea, which took the lead in allocating the 28 GHz band for IMT services, has publicly admitted that these spectrum assignments have failed.
- South Korean operator, SK Telecom, decided to cease using 28 GHz for 5G. The decision follows the footsteps of peer carriers Korea Telecom and LG Uplus, leaving no carriers using 28 GHz for 5G.
- In Japan, the mobile operators have not been able to exploit the 28 GHz band for IMT services and are far behind their rollout requirements.
- Thailand did studies on the co-existence of IMT and satellite deployments in the 28 GHz band and decided to allocate the 28 GHz band only for satellite services.

On the issue of the allocation of the 28.5-29.5 GHz band to captive non-public networks (CNPN) services, it is often misunderstood that CNPN services are indoor usage services. On the contrary, the CNPN services are deployed by organizations for private networks that span across campuses, which may be adjacent to satellite deployments. It would be next to impossible to coordinate satellite user terminals with CNPN service use, and this could cause considerable deterioration of one or both of the services.



Thus, we urge the TRAI to rethink the allocation of the 28 GHz band to both IMT and CNPN, considering that deployments in this band have not succeeded anywhere in the world. On the contrary, the satellite industry is exploiting this band for the purpose of providing broadband in unserved and underserved areas of the world, for the benefit of users who require these services.

***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.***

***or***

***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.***

We do not believe space-based communication services should be categorized into different classes of services that require different treatment for spectrum assignment and, as justified in our general comments, submits that the methodology for assignment of any space-based communication services should be administrative. The assignment of spectrum for space-based communications should be on a national level, and the licensee should be able to choose the specific frequency ranges that are intended to be used for the gateway station links and the user terminal links.

***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?***

Modern NGSO systems employ frequency sharing techniques that can avoid harmful interference by using techniques such as angular avoidance and satellite selection. It is possible to co-locate both gateway stations and user terminals with other GSO/NGSO systems, by employing appropriate frequency coordination and mitigation mechanisms. No protection distances are warranted, and operators/service providers can be licensed after ensuring that such inter-system coordination has been duly notified and/or such protection mechanisms, as prescribed by Article 22 and Resolution 76, have a favorable finding by the ITU.

***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:***





- i. Minimum Net Worth***
- ii. Requirement of existing agreement with satellite operator(s)***
- iii. Requirement of holding license/ authorization under Unified License prior to taking part in the auction process.***

***Kindly justify your response***

We refer to our general comments section, where we provide justification for the administrative assignment of spectrum for any space-based communication services. Further to such point, we would point out that the eligibility criteria for the various authorizations under the United License (UL) have already been prescribed, and the same can be applied for the administrative assignment of spectrum for space-based communications.

***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.***

We refer to our general comments section, where we provide justification for the administrative assignment of spectrum for any space-based communication services, and the spectrum resource should be shared between all satellite operators seeking to access it. Thus, the restrictions on crossholding of equity should not apply to an administrative assignment. Further to this point, we would submit the UL already contains the main set of obligations (including rollout obligations) inherent to the provision of the satellite-based communication services sought, within each service authorization.

***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.***

The co-existence of terrestrial and space-based communication services cannot be generalized. Interference mitigation strategies have to be developed between concerned operators (both on the terrestrial wireless and space-based communications side), taking into account the frequency overlap, the various protection criteria already stipulated in the ITU RR, and by incorporating necessary protection distances. The licensing conditions should stipulate a mutual frequency coordination between the operators, with an oversight by DoT's Wireless Planning & Coordination (WPC) wing.

***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.***

We refer to our general comments section where we provide justification for the administrative assignment of spectrum for any space-based communication services. Use of multiple polarizations is not only a capacity enhancing measure, but also an interference mitigation technique. The charging



mechanism should only consider the quantum of spectrum, and not consider the use of different polarizations.

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

We refer to our general comments section we provide justification for the administrative assignment of spectrum for any space-based communication services, and the spectrum resource should be shared between all satellite operators seeking to access it. The assignment of spectrum should be at a national level and should not be location based for gateway stations. Since the 27.5-29.5 GHz band is co-primary with Fixed Services (FS) stations (MWA/MWB), any location-based assignment for FSS stations will make the coordination very difficult, if not impossible.

In addition, for the smooth rollout of satellite services that can effectively address the connectivity needs of unserved and underserved areas in India, the TRAI should take into account the following issues:

1. The provision of internet services to customers in India can be effectively addressed by satellite services provided under the Internet Services Authorization (or ISP License) of the UL. However, currently, there is no prescribed charging mechanism for spectrum for the provision of satellite services under the ISP License. We urge the TRAI to address this gap by recommending a charging model for spectrum for providing satellite services under this authorization. A recommendation for a charging model for spectrum for space-based communications could also address this gap.
2. The UL allows the provision of satellite services under service authorizations with varied scope, such as GMPCS, very small aperture terminal (VSAT) closed user group (CUG) and ISP. In order to efficiently use spectrum, it should be feasible to deploy a single network that has access to spectrum and the service provided under different authorizations depending on the scope. In its recommendations on the use of VSAT for cellular backhaul connectivity, the TRAI recommended that the sharing of active and passive infrastructure owned by a licensee under any of the service authorization be allowed. However, the sharing of spectrum between service authorizations for the efficient use of spectrum was not addressed, and the same needs to be addressed.
3. WPC carries out frequency assignments through the issuance of Decision Letters. These letters assign frequencies on a carrier-by-carrier basis, which limits the operational flexibility of modern satellite systems that use dynamic frequency usage. There will be a significant administrative overhead resulting in delays of deployment of services if spectrum is to be assigned carrier-by-carrier. Instead, spectrum should be assigned as a block, and the operator should have the flexibility to dynamically use the frequencies assigned across different user terminals, gateway stations, and satellites serving India.



***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.***

The mechanisms for charging for the administrative assignment of spectrum for user terminal links and gateway station links should be based on the amount of spectrum that is being utilized by an operator. A charging mechanism based on the quantity of spectrum ensures efficient, rational, and economic use of spectrum. On the other hand, if the spectrum is charged based on a percentage of AGR, the spectrum charges could be lower for an operator that utilizes a large amount of spectrum but has a lower revenue, indicating an inefficient use of spectrum. Similarly, if an operator is able to generate higher revenues from a small amount of spectrum, that would indicate an efficient, rational, and economical use of the spectrum, and would be penalized instead of being encouraged.

**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.**

Auction determined prices of spectrum for IMT/5G services as a basis for the valuation of spectrum for space-based communications would not be appropriate for the following reasons:

1. IMT/5G deployments are envisaged only in a portion of the bands that are used for space-based communications (e.g., the 27.5-28.5 GHz band). Spectrum for space-based communications span across several frequency bands (e.g., L-, S-, C-, Ku-, Ka-, and Q/V bands). It might not be feasible to apply a uniform valuation for spectrum across the bands listed above.
2. The addressable users for IMT/5G services and for satellite-based services would be very different, and a valuation cannot be derived for one service from the other.
3. For IMT/5G services, an exclusive assignment of spectrum is required. Whereas for space-based communications, a shared assignment of spectrum would be the most appropriate approach. Both of these cannot be equated in terms of charging of fees.
4. Around the world, charges for the use of spectrum for the provision of satellite services are based on the cost-recovery principle, and the spectrum for satellite-based services is assigned administratively. Whereas the spectrum for terrestrial mobile wireless services is assigned exclusively through an auction-based process, and a price discovery mechanism is used to determine the price of the spectrum.



**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.**

The value of frequency bands for space-based communications should not be derived by comparing the spectral efficiency in relation to other bands, as this would mean many other important factors would be left unconsidered.

**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.**

Around the world, there are no examples of spectrum for satellite services in the microwave and millimeter wave bands being auctioned in order for satellite operators to access the spectrum resource. There are instances in some countries of orbital slots and the corresponding spectrum resource being auctioned; however, satellite operators who operate satellites in orbital slots filed by other Administrations (other than the local Administration) have not been subject to spectrum auctions to ensure access to the spectrum resource.

**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.**

Around the world, the charges for the assignment of spectrum for space-based communications through an administrative mechanism has been derived using a cost-recovery principle. The cost benchmarks of those countries and India might vary, and it may not be appropriate to benchmark the charges for an administrative assignment with that of other countries. We suggest that India establish its own cost benchmarks and use the cost-recovery principle to charge for spectrum for space-based communications.



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

It is possible to re-use spectrum that is used for gateway station links for user station links, as well as across different geographic locations. Any segregation of spectrum for use of gateway station links and user station links should not be carried out. Flexibility needs to be provided to satellite operators to interchangeably use spectrum as the need arises.

***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 instalments to recover deferred payments***
- iv. Rate of discount in respect of deferred payment and prepayment***

***Please support your answer with detailed justification.***

We refer to our general comments section where we provide justification for the administrative assignment of spectrum for any space-based communication services, and the spectrum resource should be shared between all satellite operators seeking to access it.