INDIAN SPACE ASSOCIATION
ISpA
Bhumandal Se Brahmaand Tak

Counter Comments on TRAI Consultation Paper on "Assignment of Spectrum for Space-Based Communication Services"

1. The Indian Space Association(ISpA) welcomes the opportunity to provide feedback on the TRAI Consultation Paper on Assignment of Spectrum for Space-Based Communication Services. At the outset, we reiterate the submissions made by us as part of our main response vide our submission dated 1st June, 2023.

2. In summary our main submissions given on 1st June are as follows, in context that *auctioning satellite spectrum is not appropriate since*:

   a) Satellite spectrum is a shared resource, and globally, it is assigned on an administrative basis.

   b) Auctioning spectrum can distort the utility of satellite spectrum.

   c) Non-exclusivity and auctions do not go together.

   d) Auctioning spectrum and then creating a sharing mechanism is self-defeating.

   e) Auctioning satellite spectrum can severely impact wider socio-economic welfare.

   f) India will be left at a competitive disadvantage versus global / other countries if space spectrum is auctioned.

   g) The Supreme Court judgments didn't mandate auction as the sole method in every case.

   h) Auctioning will create too many complexities, making the exercise infeasible.

   i) Auctioning spectrum will have a detrimental impact on startups and pre-empt competition.

3. Please see below our counter comments for your consideration, we submit these additional submissions in response to comments provided by certain stakeholders in reference to the following issues.

4. The much-awaited Consultation Paper (CP) received a significant response, with a total of 64 insightful submissions. After careful review, we would like to highlight some key findings. These findings highlight the

need for careful consideration when deciding on the best approach for spectrum assignment i.e., administratively *(see Fig 1)*.

a) All space startups that participated in the consultation expressed their opposition to the auction, as did 75% of companies/organizations.

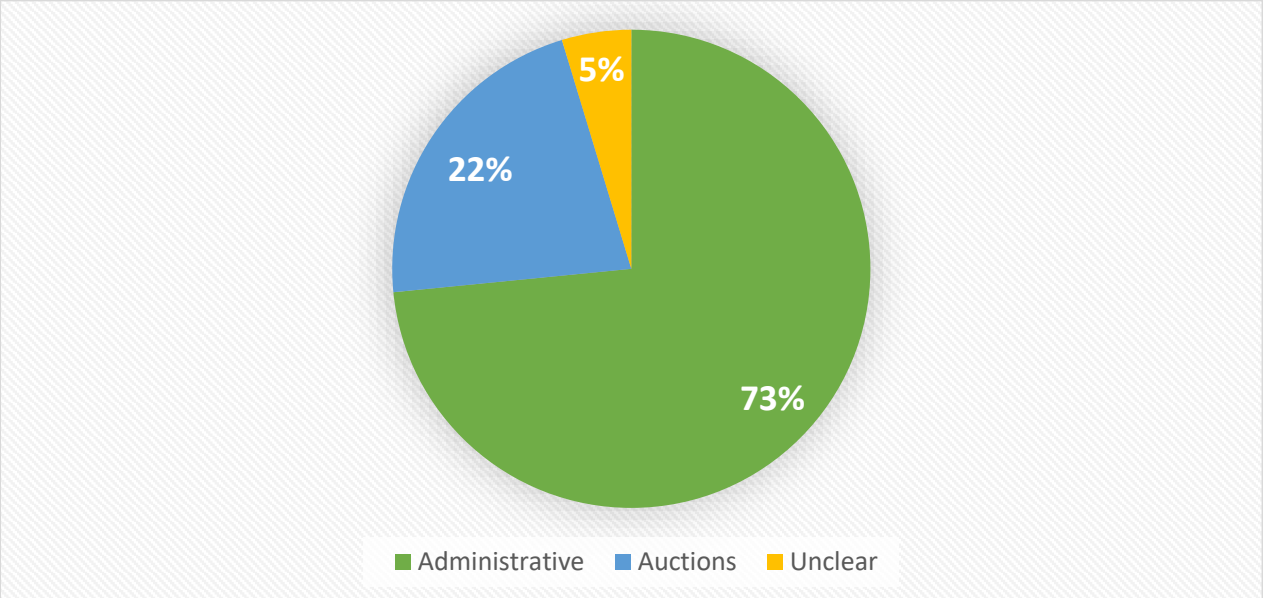
b) Similarly, 75% of the industry associations (including 100% private space associations) oppose auctioning of spectrum for space.

c) There is a dissonance even among the terrestrial operators where 2 out of 3 operators have difference of opinion.

5. Consequently, the strong opposition from space startups and industry associations, amounting to approximately 73%, necessitates the administrative assignment of spectrum that promotes fairness, competition, and innovation in the nascent sector.

	Entities who are opposing the Auction	**Entities in support of Auction**	**Entities having Neutral or Miscellaneous stance**
Companies (including Service Providers)	**34**	**9**	**1**
Associations	**12**	**4**	**0**
Individuals	**1**	**1**	**2**
Total - 64	**47 (~73%)**	**14 (~22%)**	**3 (~5%)**

Figure 1 A visual representation of the responses expressed by stakeholders



Unmasking the Misconception: Same Service, Same Rules - Space-based Communication Services vis à vis IMT Services

6. The recently released Indian Space Policy – 2023 provides regulatory certainty for space activities by various stakeholders, creating a thriving space ecosystem. In alignment with international standards and regulations, the Indian Space Policy 2023 emphasizes the importance of coordinating spectrum use through the International Telecommunication Union (ITU) through WPC (Wireless Planning Commission) wing of DoT (Department of Telecommunications).

7. Agreeably, the ITU recognizes the unique characteristics of space-based communication services and have established specific regulations and frameworks for allocation of orbital slots, spectrum allocation, coordination, and interference mitigation. These frameworks differentiate space-based communication services from terrestrial services, acknowledging the technology and topology-specific requirements of satellite systems. ***The notion that mobile services and space-based communication services are interchangeable and should adhere to the same regulatory frameworks is completely incorrect and based on wrong premises.*** Fixed satellite systems (FSS) and Mobile satellite systems differ significantly from terrestrial communication. While terrestrial services exclusively use spectrum allocated to each operator, satellite spectrum is a shared resource. In the case of FSS, multiple entities can utilize the same satellite spectrum, employing technological capabilities that enable efficient operation and interference management. The ITU coordination mechanisms play a crucial role in facilitating interference-free sharing of spectrum among various GSO/NGSO systems, as outlined in Article 9 of the ITU Radio Regulations.

8. The example of auction of MSS (Mobile Satellite Service) spectrum in Saudi Arabia does not justify a similar process for all satellite spectrum. Rather, it significantly oversimplifies the complexities and distinctiveness of satellite services such as FSS and BSS. They serve different purposes, have unique operational characteristics and require divergent approaches for spectrum allocation. Making out this single instance of MSS spectrum auctioning in Saudi Arabia to be a universal model is disingenuous. It overlooks the broader international trend against spectrum auctions, especially for satellite services. It is important to recognise that what works in one country or for one type of satellite service might not be the best solution elsewhere or for other services. It also disregards the global norm of coordinating and sharing FSS spectrum, which has proven to efficiently maximise spectrum usage and serve public interest effectively.

9. **The global nature of Satellite Spectrum**: To quote a stakeholder submission, "*that NGSO satellite operators are strategically planning their networks to compete with terrestrial communication service provider….*" is ill-founded as this claim doesn't accurately reflect the reality of the situation. NGSO and GSO satellite systems have a global coverage capability, serving areas where terrestrial infrastructure is limited or non-existent. They are designed to provide connectivity to underserved regions, remote areas, and maritime environments where terrestrial networks face challenges in deployment and have been unable to provide the requisite connectivity. By nature, satellite spectrum has no national territorial limits. Normally mobile services primarily focus on populated areas with a large number of subscribers, to recover the high costs of spectrum and infrastructure. Space-based communication services target the provision of connectivity to underserved rural, remote areas and are akin to essential services and need to be nurtured, protected, and fostered in the public interest. There are vast regions where terrestrial infrastructure deployment is economically unviable or technically challenging due to factors like difficult terrain or low population density. In these areas, satellite communication plays a crucial role in providing reliable and accessible connectivity. They complement terrestrial networks by filling coverage gaps and ensuring ubiquitous connectivity. Rather than being a direct competitor, satellite communication acts as a complementary and supplementary solution to terrestrial services, enhancing the overall communication ecosystem. Therefore, the focus of satellite operators is to address the connectivity needs of underserved populations and areas where terrestrial networks face limitations, thus fostering digital inclusion and bridging the digital divide in the country. Auctions are likely to create gatekeepers and increase the cost of the spectrum to the service providers, and resultingly increasing the cost of service to the end consumer. This will be against public interest and severely impact socio-economic welfare.

Addressing the Perceived Technological Encroachment

10. **Challenging Satellite Technological Progress:** Some terrestrial stakeholders have highlighted the technological advancements achieved in space-based communication services and its perceived encroachment on the terrestrial service sector. They hence, argue that satellite spectrum and terrestrial spectrum are not fundamentally distinct and should be subject to similar regulatory frameworks. This premise that space-based communication services & terrestrial communication is same is fundamentally incorrect.

11. Space-based communication services serve as a vital means of connecting unserved and underserved areas, offering a diverse range of

applications that go beyond the capabilities of mobile networks. Satellite networks employ a fundamentally distinct spectrum sharing mechanism compared to terrestrial networks. Unlike terrestrial mobile services where spectrum is allocated to a single operator within a geographic area and cannot be shared among operators, satellite systems enable multiple operators to utilize the same spectrum to serve the same geographic region. Consequently, adopting an auction-based approach for allocating spectrum that can be shared between satellite operators, such as the C/Ku/Ka bands, would result **in unnecessary fragmentation** and **inefficient spectrum utilization**. This is substantiated by the absence of any instances where satellite spectrum in these bands has been assigned through auctions in any country. The recent auctions in Thailand were specifically for orbital slots and not satellite spectrum. These auctions had limited participation and incomplete sellout, there were only two bidders, including one a government-owned company, and only three out of the five available slots were sold. This example highlights the challenges and limited success of auctions in promoting competition with the telecommunications sector. Moreover, the auctioning of an orbital slot doesn't necessarily mean the exclusive right to use a certain range of frequencies (spectrum) is granted as well. The same spectrum can still be shared among different satellite operators with satellites in different orbital slots. In this particular case of Thailand, although some frequencies were associated with the orbital slot that was auctioned, the same frequency is still accessible to other operators. It is worth mentioning that only a few countries have attempted to auction satellite assets for domestic use, such as national orbital slots, and these countries have either discontinued the practice (as observed in the US since 2004 and Brazil since 2021) or encountered difficulties with unsuccessful auctions (as witnessed in Thailand and Mexico).

12. The design of the satellite system ensures that the gateway stations and the user stations within a beam do not use the same portion of the spectrum. As a result, such a scheme of bifurcating spectrum use between gateway/feeder link stations and user terminals differs from system to system. Advocating for the auctioning of all spectrum irrespective of technology contradicts the principle of facilitating the coexistence of diverse services such as TV broadcasting, fixed satellite services, and mobile satellite services. Each service serves a distinct purpose in serving the nation and its citizens.

On the Misconception of Convergence of Technology and Technology Neutral Use of Spectrum

13. One of the submissions by a stakeholder assessed the 3GPP Release 17/18, as a catalyst for the emergence of integrated networks & its utilization of shared frequency bands by both terrestrial and satellite networks. However, it is important to note that such integrated networks have not yet been implemented on a global scale. Moreover, the development of integrated networks specifically emphasizes that the coverage of the satellite access network extends beyond the coverage of the terrestrial access network. It is worth noting that the stakeholders have selectively but wrongfully focused on one particular used case while disregarding other important Space based communication services and their unique demands.

14. It is essential to consider the diverse use cases and target areas of Space based communication services, including their specialized applications in government and defence sectors. These specific requirements necessitate a distinct and separate spectrum assignment approach which are mentioned below:

(A) **Targeted Coverage**: Mobile networks are designed to provide connectivity in both urban and rural areas where terrestrial infrastructure is available. In contrast, Space based communication services specifically focus on reaching areas that lack adequate terrestrial coverage. By targeting unserved and underserved regions, Space based communication services play a crucial role in bridging the digital divide and connecting populations that would otherwise be left without access to communication services.

(B) **Multiple and Unaddressed Use Cases**: Space based communication services offer a wide array of use cases that go beyond the scope of mobile services. These include Direct to Home (DTH) television broadcasting, Electronic News Gathering (ENG) for remote journalism, Very Small Aperture Terminals (VSAT) for remote communication, Internet of Things (IoT) and Machine-to-Machine (M2M) connectivity, backhauling data to mobile network applications. These diverse applications highlight the unique capabilities and advantages that satellite technology brings to various sectors. Certain applications and use cases, such as DTH broadcasting and remote communication via VSAT, are not served by mobile networks. Space based communication services provide a reliable and efficient solution for these specific requirements, enabling seamless connectivity in areas where terrestrial networks are limited or unavailable. Ignoring the distinct needs and challenges

of these use cases would undermine the potential benefits that Space based communication services offer.

(C) **Government and Defense Applications**: Satellite communication services play a crucial role in fulfilling government and defense requirements. They provide essential communication channels, reliable data backhauls, and secure connectivity for various national security purposes. These specialized use cases necessitate distinct considerations that differ from those applicable to mobile networks, given the unique demands and complexities involved in government and defense operations.

15. **No interference/ adverse effect by LEO systems to broadcast/ DTH services**: There have been concerns raised by certain stakeholders in the broadcasting industry claiming that Low Earth Orbit (LEO) systems could interfere with broadcast and Direct-to-Home (DTH) services. However, these concerns are incorrect for several reasons. First and foremost, broadcast services primarily utilize the C Band frequency range, while LEO systems are largely currently operating in the Ka Band. Furthermore, DTH systems in India specifically operate within a designated portion of the Ku Band intended for Fixed Satellite Service (FSS). Hence, there would be an unlikely chance of any LEO satellite systems adversely affecting the broadcast of DTH services. However, in the event of any overlapping usage of frequency bands, interference can be effectively managed by adhering to the limits specified in Article 22. Additionally, it is worth noting that Geostationary Orbit (GSO) and Non-Geostationary Orbit (NGSO) systems can coordinate their operations within bands where the limits outlined in Article 22 do not apply.

The Supreme Court Judgments Not Applicable to Satellite Spectrum as it as a Shared Resource

16. The reliance placed on the 2G Judgment in the current scenario is wholly flawed and entirely untenable. The 2G Judgment was made with regard to the arbitrary grant of terrestrial spectrum for exclusive usage. However, spectrum used for space-based communication is non-exclusive by its very nature and, hence, the 2G Judgment cannot be extrapolated to rule on satellite spectrum.

17. The Hon'ble Supreme Court, as part of the 2G case, has not mandated that all spectrum should be auctioned. Reference may be drawn to the Presidential Reference to the Hon'ble Supreme Court in the 2G matter, wherein the Hon'ble Supreme Court stated "*Auction as an economic choice of disposal of natural resources is not a constitutional mandate. The Hon'ble Court said that it is the prerogative of the Government to decide the method*

of alienation of public resources, provided the method is transparent, fair and backed by social or welfare purpose".

On Method of Charging for Satellite Spectrum

18. Valuation is just one aspect of spectrum management, and it is important to consider other factors such as competition, innovation, and public interest when determining the appropriate assignment and use of spectrum.

19. While auction is a common method used to allocate scarce resources, such as terrestrial spectrum; in the case of satellite spectrum, auction is neither a common method nor even a preferred one, and instead it is administrative allocation that is common method in case of satellite spectrum. This is because the satellite spectrum by nature is shared unlike terrestrial spectrum which is exclusive. Further, in case of auction, the winning bidder will have to still share the spectrum with other users. Hence, there is no motivation for the bidder to be the highest bidder, as they will not be able to use all of the spectrum that they purchase. It makes the entire proposition of auctioning satellite spectrum an unnecessary exercise, exacerbating the complexity of allocation and compromising the utility of nature of spectrum.

20. It is suggested to keep the price of satellite spectrum at a reasonable percentage of AGR. This is industry friendly method, helps the regulator to get share of the growth of the industry, and brings in the required transparency.

Auction of Satellite Spectrum Overlook Intangible Gains for the Country

21. It is crucial to acknowledge the distinction between tangible and intangible gains when considering the benefits of satellite spectrum in the context of the space industry in India. At present, the Indian space industry is still in its early stages of development, and leveraging satellite communication holds immense potential for bridging the digital divide.

22. The vast geography of India presents a significant challenge when it comes to fiberization efforts. Despite the assistance of the United Service Obligation Fund (USOF), attempts to extend fiber networks to remote regions have been unsuccessful. The low population density and inadequate demand in these areas make it economically unviable for telecommunications companies to meet the national broadband objectives solely through fiber infrastructure.

23. Satellite communication offers a unique opportunity to connect people in remote and underserved areas, enabling them to access essential services, educational resources, healthcare facilities, and economic opportunities. By bridging the digital divide, satellite-based broadband has the potential to drive significant socio-economic development in these regions.

24. For example, the Indian Satellite Broadcasting Industry or broadcasting and cable industry provides direct and indirect employment to 4.5 million people. The industry caters to 800 million viewers and comprises of content creators, teleport operators, broadcasters, and Distribution Platform Operators. Satellite spectrum is crucial to the functioning of this industry as broadcasters rely on the C-Band (3.7GHz to 4.2 GHz) to seamlessly distribute 885 registered TV channels to the DPOs. Furthermore, DTH operators use the Ku-Band (10GHz to 15 GHz) to distribute TV channels to their subscribers.

25. Similarly, satellite communication emerges as a viable solution to provide high-speed broadband access to underserved areas.

Global Harmonization of Bands & Adequacy of Bandwidth For Telcos

26. The satellite industry recognizes the importance of collaboration and cooperation in the development of 5G and 6G ecosystems. Despite the non-exclusive and shared nature of their spectrum usage, satellite operators actively support the deployment of 5G in India. They advocate for the utilization of spectrum bands that have been internationally harmonized for terrestrial IMT/5G by the ITU (International Telecommunication Union). An example of such a band is the 24.25-27.5 GHz (26 GHz) band. By aligning with internationally harmonized spectrum bands, India can foster compatibility and interoperability with global 5G networks, facilitating seamless connectivity and maximizing the potential of emerging technologies.

27. India can chart a favorable course by leveraging globally harmonized spectrum bands for 5G while effectively utilizing the full 27.5-29.5 GHz spectrum range for satellite operations, hence aligning with established global practices. This approach finds support in the outcome of the World Radio Congress-2019, where more than 17 GHz of spectrum bandwidth was identified for Mobile/IMT (International Mobile Telecommunications) use. Notably, the 26 GHz band, which falls under the mmWave (millimeter wave) category and is designated for 5G, was among the bands recognized for mobile services.

28. India is already well-positioned with over 3250 MHz of spectrum bandwidth allocated in the 26 GHz spectrum band for mobile operators. Notably, all countries utilizing mmWave for 5G generally offer approximately 400 MHz per operator, with examples such as Japan, Taiwan, and Australia adhering to this allocation. Even South Korea, which awarded up to 800 MHz per operator, has only deployed 161 mmWave towers, falling significantly short of the required 45,000 towers as per a World Bank report.

29. It is important to note that globally countries have taken proactive measures to address this issue. They have prioritized the entire 28 GHz band (27.5 – 29.5 GHz) for satellite broadband without fragmenting or sharing it with 5G services. This strategic approach is based on the understanding that 5G already has access to multiple substitute bands and a considerable amount of available spectrum. The distribution of available spectrum for different purposes, as depicted in figure data, highlights the need to safeguard the 27.5 – 29.5 GHz band for ongoing satellite broadband usage.

30. Ms Jessica Rosenworcel, Chairperson of the FCC, has previously emphasized the potential drawbacks of exclusively focusing on millimeter wave spectrum for 5G deployment. While millimeter wave frequencies possess high capacity, their limited propagation range necessitates a higher number of ground-based facilities to ensure viable signal coverage. This approach can be costly and could potentially exacerbate the digital divide if it is solely relied upon as the primary spectrum solution for 5G.

31. Numerous regions and countries, including the European Union, most of the Americas, Africa, the Middle East, China, Australia, and increasingly across ASEAN, have actively protected the 27.5 – 29.5 GHz band to fully harness the economic and national coverage benefits offered by satellite-powered broadband. This unified stance emphasizes the global consensus on the significance of preserving this specific spectrum range for satellite communication.

Involvement of ITU in the Assignment of Satellite Spectrum

32. Some of the stakeholders have claimed that the role of the International Telecommunications Union (**"ITU"**) and its Radio Regulations (**"ITU-RR"**) is only limited to interference mitigation and to enable the sharing of spectrum amongst satellite operators as well as do not impose any limitations on the methodology used for spectrum assignment within a country.

33. Satellite spectrum is governed by the ITU-RR. And it is also the ITU-RR that decides the parameters that form the basis for India's National Frequency Allocation Plan. This is why the resources are not deemed independent of orbit-parameters and planned service areas and are collectively referred to as "spectrum-orbit resources" by the ITU. In fact, Article 44 of the ITU Constitution actually states that these spectrum-orbit resources are to be shared among all countries and must be used in conformity with the parameters laid down by the ITU-RR.

34. Furthermore, under the co-ordination mechanism prescribed by the ITU-RR, ITU member countries have been able to ensure that each satellite operator operates efficiently within its allocated frequencies and geographies. This same mechanism has also been used to design the network topology and determine the deployment of satellites in orbit.

35. Additionally, since these satellite spectrum bands are a shared resource within the country and elsewhere, the arrangement is not constrained by the boundaries of any specific country. All countries and operators are able to use it at the same time and in a harmonious manner, unlike the terrestrial spectrum.

36. It is very important that all national administrations, when making decisions regarding satellite spectrum, take into account the international nature of this resource, even if they do not deem the ITU to have authority over member countries' methodology for spectrum assignment or pricing.

37. Additionally, it is for a country's administration to decide whether it intends to remain aligned with and follow the strict co-ordination and interference mitigation rules defined and agreed to by the ITU for smooth outer-space operations or whether it would rather create a space war like situation that ends up restricting the already deployed constellations and rendering available capacity unusable in terms of serving customers in India.

38. Basically, the auctioning of satellite spectrum will be akin to asking each NGSO operator to deploy completely separate constellations to serve its customers in India.

39. The **national spectrum assignment, while a domestic process, must be conducted in harmony with the international framework provided by the ITU**. This will ensure smooth and efficient usage of radio-frequency spectrum on a global scale, preventing interference, and enabling the satellite industry to provide reliable services across borders. Ignoring this

integral role of the ITU in the broader spectrum management framework is indicative of a limited understanding of the complexities of global radio-frequency spectrum management, especially in relation to the satellite industry.

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