

Ref. No. SIA-India/TRAI-CP 6/23 /2023

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To

Shri Akhilesh Kumar Trivedi  
Advisor (Networks, Spectrum and Licensing)  
TRAI, Mahanagar Doorsanchar Bhawan,  
Jawahar Lal Nehru Marg, New Delhi- 110002

**Sub: SIA-India comments on TRAI Consultation Paper No. 6/2023 on Assignment of Spectrum for Space-based Communication Services.**

Dear Sir,

SIA-India is a non-profit organisation, established with the objective of serving and promoting the common interests of the satellite communication ecosystem in India. The space sector plays a crucial role in the infrastructure, communications, defence, and security of a nation. It holds great potential in connecting rural and unconnected users, as well as benefiting various socioeconomic sectors like disaster management, agriculture, healthcare, education, transportation, and energy. Satellites are key to bridging the digital divide and achieving universal broadband access, which is a fundamental right for all citizens, through the National Broadband Mission. Ensuring access to necessary spectrum resources is essential for the efficient operation of these sectors.

Satellites have become a well-established and important technology for delivering telecommunications, broadband, and media services. Satellite communications not only support economic development and social objectives, but also contribute to national and regional integration and India's diplomatic strength. Many new satellite systems have been launched in recent years with the ability to serve India and its neighbouring countries. Therefore, the collaborative and active partnership between the space sector and the Government is essential to sustain and accelerate the progress on the aforesaid fronts with an effective spectrum policy in line with global practices.

As an industry association, the SIA-India welcomes and commends the Telecom Regulatory Authority of India's (TRAI) efforts to streamline and evaluate the spectrum and licensing needs of space sector through consultation process, with a motive that India becomes an attractive and competitive market for the private space industry.

We duly acknowledge that this consultation is very crucial to ensure that spectrum required by the space industry is sufficiently and timely available for the continuation and growth of services that are essential to the Indian economy. India's spectrum use must align with global practices and for the nascent satellite communications sector to have full and exclusive access to ITU-harmonized spectrum bands.

We also sincerely appreciate that the Government of India is continuously striving to promote the space sector through a slew of proactive measures of late including the recent unveiling of the Indian Space Policy 2023 by the Department of Space ("DoS") and subsequent Department of Telecommunications ("DoT") consultation on streamlining processes for facilitating space objects. However, we are

apprehensive that the pertinent questions in the Consultation Paper [CP] are likely to derail the ongoing momentum in the satellite sector, especially on the following issues:

- (i) Most of the questions in the CP explicitly reveal that the intent of the consultation process revolves around the 'auction' process of the satellite spectrum in the critical C-Ku- and Ka-bands. The satellite spectrum is a globally shared resource, and the same frequencies can be extensively reused at the same geographic locations by multiple satellite networks. Therefore, unlike for terrestrial spectrum, exclusive assignment of satellite spectrum through an auction mechanism is technically impractical, difficult to implement, and likely to lead to fewer new satellite services and technologies being available in India and a less competitive industry overall.

SIA-India notes that frequency bands for space-based communications are internationally agreed upon by the ITU, and the use of these frequencies is not independent of the orbit parameters and planned service areas. This is why it is referred to as a "spectrum-orbit resource" by ITU. Article 44 of the ITU Constitution states that spectrum-orbit resources are shared among all countries and must be used in conformity with the Radio Regulations.:

While an auction may maximize revenue, it may not always be the best way to serve the public good. An auction-based approach in the case of satellites would lead to fragmentation, and exclusive allocation to powerful players, and prevents smaller players, start-ups, and academia from accessing the necessary spectrum. There is simply no good policy reason to put satellite spectrum into the hands of limited players when that spectrum is technically capable of being used by multiple players under well-established principles of international law. Most countries, including major space-faring nations, use fair and transparent administrative processes to assign satellite spectrum on a non-exclusive basis.

SIA-India undertook an elaborative study on the right mechanism for satellite spectrum assignment and concluded that an auction mechanism is impracticable and detrimental to the interests of the sector. [The study paper 'A Balanced Approach for Spectrum Allocation' and white paper 'Satellite Spectrum Allocation: International Best Practice Learnings' are enclosed for your kind perusal as **Annexure-1.**]

In SIA-India's view, satellite spectrum auctions are not required as a matter of constitutional law. The Supreme Court has indicated that revenue maximization through auctions may not always serve the public good. Since satellite spectrum falls under the public good doctrine and is utilized by smaller players and startups, it should not be allocated through auctions.

In a broadcasting case, the 1995 Supreme Court judgement on Airwaves was delivered by a 3-judge bench that mentioned "The airwaves or frequencies are public property. Their use has to be controlled and regulated by a public authority in the interests of the public and to prevent the invasion of their rights. Since the electronic media involves the use of the airwaves, this factor creates an in-built restriction on its use as in the case of any other public property."

In a 2012 Telecom/2G case, the Supreme Court clarified that an auction is not a constitutional mandate for natural resource allocation, and methods other than auction can be used. The 2G Case, as interpreted by Special Reference No. 1 of 2012, established that public authorities granting licences must adopt (1) “a transparent and fair method” that ensured all eligible persons had a chance to compete; (2) a “rational method” to avoid scuttling the claims of worthy applicants; and (3) “non-discriminatory method” for the protection of the national/public interest. An auction was considered “perhaps the best method” for issuing the mobile spectrum licenses in the 2G Case, but “the recommendation of auction for alienation of natural resources [in the 2G Case] was never intended to be taken as an absolute or blanket statement applicable across all natural resources.” This is because the same frequencies can be extensively reused at the same geographic locations by multiple satellite networks, exclusive auctions of satellite spectrum would be particularly inappropriate and detrimental to both existing satellite services in India, the future growth of the industry, and India’s goals for universal broadband.

SIA-India asserts that TRAI should recommend that the Government adopts an administrative method – based on the ITU framework – for the assignment of satellite spectrum as such a process would be better aligned with the Government’s goals for the new Indian Space Policy 2023.

- (ii) The CP moots the idea of sharing the 28 GHz Ka-band (27.5-29.5 GHz) for IMT use and CNPN. At WRC19, the band 27.5-29.5 GHz was not identified for International Mobile Telecommunications (IMT). As a result, the band 27.5-29.5 GHz should not be considered for IMT, “flexible use” or CNPN services. Countries that have introduced IMT or “flexible use” in these bands have seen limited deployments owing to the short range of these frequencies and the high capital expenditures required for terrestrial deployments in this band. In contrast, countries that did not introduce IMT or “flexible use” in these bands have seen robust growth and expansion of advanced satellite services in geostationary and non-geostationary orbits.
- (iii) The Consultation Paper titled “Auction of Spectrum in frequency bands identified for IMT/5G” released in 2021 discussed the allocation of spectrum for 5G IMT. In reference to this, the Parliamentary Standing Committee on Information Technology (2020-21) of the Seventeenth Lok Sabha presented a report on “India’s Preparedness for 5G” to the Indian Parliament on 8th February 2021. The report highlighted that the spectrum for 5G IMT should only be utilized up to 27.5 GHz and not extended to 28.5 GHz. This information can be found on page 143, paragraph 29. Additionally, on page 141 of the report, paragraph 23, the Cellular Operators Association of India (COAI) recommended a spectrum block size of 400 MHz per 5G operator in the mmWave bands. This requirement can be easily fulfilled within the 3.25 GHz globally harmonized 5G/IMT spectrum range in the 26 GHz band (specifically, from 24.25 GHz to 27.5 GHz), as identified by WRC-19.
- (iv) Conclusion In the Report of the Comptroller and Auditor General of India on Management of Spectrum assigned on the Administrative basis to Government Departments/ Agencies on Page 75 is also suggestive that” mmWave bands (24.25–27.5 GHz band; 37–43.5 GHz band and 66–71 GHz band)” are for IMT use.

- (v) The 26 GHz band was auctioned in India to mobile operators in 2022, but a significant portion of the available spectrum blocks remained unsold as the operators decided not to purchase the entire band. The roll out is challenging mainly because of the physical restriction of the waves travelling far in a terrestrial environment, leading to multi hundred-fold (if not thousand) more towers than 5G in 3.5 GHz band to cover the similar large geography.

In SIA-India's view, this band should be exclusively reserved for satellite use in India in order to accelerate broadband deployment, establishing necessary mobile backhaul infrastructure, ensuring last-mile connectivity, supporting IoT, M2M, communications on the move and promoting growth in India's space sector. Allowing any sharing regime in this critical band would hinder the future growth and expansion of current satellite services and impede the introduction of new satellite services.

- (vi) Applying the same spectrum rules to both mobile operators and Indian VSAT satellite operators would be unfair due to the significant revenue disparity between the two. This would violate Article 14 of the Constitution of India, which calls for equal treatment of equals and unequal treatment of unequals. Therefore, spectrum assignment decisions should consider the need for fair and equitable treatment, as the "same service, same rules" principle may not be practical in this context.

With the above general points in mind, SIA-India is pleased to provide our views/comments in **Annexure-2** on TRAI CP on the Assignment of Spectrum for Space-based Communication Services.

At this juncture, we firmly believe that TRAI is uniquely placed to play an active role in addressing the spectrum needs and shaping the regulatory framework/certainty through its sagacious recommendations giving due consideration/weight to our responses that the current and future satellite investment depends on, thereby adding flexibility to serve new segments that impact Indian citizens. Hence, the actions taken by TRAI through this consultation should have a major influence on the capabilities of the Indian space industry to meet its growth objectives.

Yours sincerely,



Anil Prakash  
Director General  
SIA-India  
Mob: +91-98682 62969

Encl: As above

## Annexure-2

### **SIA-India's comments to TRAI Consultation (No.06/2023) on Assignment of Spectrum for Space-based Communication Services**

**18 May 2023**

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

Prompted by the modern need for broadband connectivity everywhere, the global satellite industry has entered a phase of rapid growth and technological innovation. Multiple satellite operators have launched a plethora of conventional and High Throughput Satellite (HTS) systems in Geostationary (GSO) and Non-Geostationary (NGSO) orbits using a wide variety of frequency bands.

Therefore, to meet the growing demand for space-based communications and to ensure that India can take full advantage of global developments in the satellite industry, India should make available the full range of frequencies allocated for the Fixed Satellite Service (FSS), Broadcasting Satellite Service (BSS), and Mobile Satellite Service (MSS) by International Telecommunication Union-Radio Communication Sector (ITU-R) for global harmonization purposes and the same should be invariably reflected in the National Frequency Allocation Plan table.

At a minimum, the following frequency ranges shown in Table 1 below should include, those commonly used in India today for effective and efficient space-based communications:

**Table 1 – Common Satellite Bands**

<b>Band</b>	<b>Frequency Range</b>	<b>Direction</b>	
L-band	1.518-1.559 GHz	Downlink	MSS
	1.610-1.6605 GHz	Uplink	

	1.668-1.675 GHz		
S-band	2.170-2.200 GHz 2.4835-2.520 GHz	Downlink	MSS
	1.980-2.010 GHz 2.670-2.690 GHz	Uplink	
S-band	2.550-2.630 GHz	Downlink	BSS
C-band	3 400-4 200 MHz	Downlink	FSS frequency band not subject to ITU space plans
	5 850-6 725 MHz 7 025-7 075 MHz	Uplink	
	4 500-4 800 MHz	Downlink	FSS frequency band subject to ITU space plans (RR Appendix 30B)
	6 725-7 025 MHz	Uplink	
Ku-FSS	10.95-11.2 GHz 11.45-11.7 GHz 12.2-12.75 GHz	Downlink	FSS frequency band not subject to ITU space plans; Ku- band NGSO
	13.75-14.5 GHz	Uplink	
	10.7-10.95 GHz 11.2-11.45 GHz	Downlink	FSS frequency band subject to ITU space plans (RR Appendix 30B); Ku-band NGSO
	12.75-13.25 GHz	Uplink	
Ku-BSS	11.7-12.2 GHz	Downlink	FSS frequency band subject to ITU space plans (RR Appendix 30); Ku-band NGSO
	14.5-14.8 GHz 17.3-18.1 GHz	Uplink	
Ka-band	17.7-21.2 GHz	Downlink	FSS frequency band not subject to ITU space plans
	27.0-31.0 GHz	Uplink	
Q/V-band	37.5-42.5 GHz	Downlink	FSS frequency band not subject to ITU space plans
	47.2-51.4 GHz (except 50.2-50.4 GHz)	Uplink	

In India today, multiple satellites use various portions of these bands to deliver Internet and broadband connections countrywide, connect remote and sparsely populated areas, and expand the coverage of 4G (and soon 5G) mobile networks. Satellites using these frequencies are also used in India for live news gathering, direct-to-home (DTH) satellite TV, and distributing popular Indian and foreign content channels. Strategic government users also use these bands on ISRO satellites. As

per the recently released "Indian Space Policy - 2023, even more, GSO and NGSO satellites can be expected to use these bands, new bands (such as the Q/V-band) to provide services in India (see the response to Q2).

**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:**

Multiple satellite operators operating different satellite systems already use the spectrum mentioned in response to Q1 (see Table 1) in varying combinations for both gateway and user links today, and more such systems are expected to come online within the next five years.

It is artificial for TRAI to think about the demand for satellite spectrum in terms of separate spectrum for gateways and user links. Each satellite band can be used interchangeably for satellite gateways and/or user links, in accordance with the ITU-R Radio Regulations. This interchangeability is reflected in the wide variety of frequency plans on satellite systems already in orbit or under construction.

For example, in traditional wide beam C-band geostationary satellites, the allocated uplink and downlink spectrum is commonly used for gateways or user beams, depending on customer requirements. In some High Throughput Satellite designs, portions of the C-band may be used as gateway spectrum to support Ku-band spot beams (e.g. Intelsat EPIC), or the Ka-band may be used as gateway spectrum for Ku-band spot beams (e.g. GSAT-29, **GSAT 11**, **GSAT 19**, SES-12, Starlink, OneWeb). Yet other designs use the Ka-band for both gateways and user links (e.g., GSAT-20, ViaSat-3, O3b). The newest satellite designs have software-defined payloads (e.g., O3b mPOWER, Telesat Lightspeed) that can create beams as required and deploy any frequency into such beams for gateway or user links. Several satellite operators have also announced next-generation satellites using Q-/V-band frequencies for

gateways and/or user links. Indeed, ISRO itself has launched a demonstration Q-/V-band payload on GSAT-29.

It is also artificial for TRAI to think about separate spectrum demand for different satellite applications, such as access, Internet, VSATs, DTH, etc. Satellite frequencies are used today in varying combinations and proportions on multiple satellites to support the full range of communications applications, depending on the satellite operator’s business model and customer demand (which can change over time). For example, the C-band over India is used for video distribution and VSATs, ENG and IFMC applications. The same is true for the Ku-band and Ka-band, used in India for Internet, VSAT, and IFMC applications in varying proportions by satellite. At the same time, the Ku-band also supports DTH satellite services across India.

As noted in the response to Q1, the global satellite industry has entered a phase of rapid growth and technological innovation. Current and future demand for satellite spectrum is therefore growing and can be found by looking at the full range of frequency bands that have been embarked on the satellites in-orbit today and which have been announced or are being contemplated for future satellites in the next five years. In most cases, and especially for the latest HTS and software-defined satellite systems, the full range of the indicated satellite bands has been or will be deployed for both gateway and/or user links.

Table 2 below provides a representative list of the satellite bands deployed today and that will likely be deployed in the next five years, with the ability to serve India.

**Table 2 – Satellite Spectrum Deployed Today and In 5 years**

System	GSO / NGSO	L-band / S-band	C-band	Ku-FSS	Ku-BSS	Ka-band	Q/V-band
ISRO	GSO	Yes (S-band)	Yes	Yes	Yes	Yes	Yes
Amazon Kuiper	NGSO (in 5 years)			Yes (in 5 years)			
AsiaSat	GSO		Yes	Yes	Yes	Yes (in 5 years)	

System	GSO / NGSO	L-band / S-band	C-band	Ku-FSS	Ku-BSS	Ka-band	Q/V-band
Inmarsat	GSO NGSO in 5 years	Yes (L- band)	Yes			Yes	Yes (in 5 years)
Intelsat	GSO NGSO in 5 years		Yes	Yes	Yes		Yes (in 5 years)
Measat	GSO		Yes	Yes	Yes	Yes	
Omnispace	NGSO	Yes	Yes			Yes (in 5 years)	
OneWeb	NGSO			Yes	Yes	Yes	Yes (in 5 years)
PT Telkom	GSO		Yes				
SES	GSO & NGSO		Yes	Yes	Yes	Yes	Yes (in 5 years)
Starlink	NGSO	Yes (in 5 years)		Yes	Yes	Yes	Yes (in 5 years)
Thaicom	GSO		Yes	Yes		Yes	
Telesat	GSO NGSO in 5 years		Yes	Yes		Yes (in 5 years)	
Viasat	GSO & NGSO in 5 years					Yes	

An important thing to note about Table 2 is that the same frequency ranges are being used over and over again by multiple satellite operators in geostationary and non-geostationary orbits, under the framework of the ITU-R Radio Regulations and the authorizations issued administratively on a non-exclusive basis by multiple administrations. If India were to auction or otherwise assign satellite spectrum domestically on an exclusive basis, the result would be fewer existing and new satellite systems being able to offer competing services in India than would otherwise be possible under a non-exclusive administrative licensing process. This is a result to be avoided as it would counter the goals of India’s new Space Policy.

**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.**

The need to coordinate the use of the same frequency range among NGSO systems has yet to impose a practical limit on the number of NGSO constellations. NGSO satellite systems can vary widely in design and scope. In general, however, they can co-exist as long as co-frequency in-line events – where two NGSO satellites near the same spot in the sky are trying to communicate with two earth stations near the same spot on the ground using the same frequency – are avoided and/or managed. The usual method for managing such events is for one or the other NGSO networks to switch to a different satellite or use a different frequency to avoid such an in-line event or frequency overlap. While some issues about NGSO and GSO co-existence are currently open at the ITU, SIA-India is of the view that compliance with the ITU Radio Regulations provides a well-understood framework for NGSO satellite operators to coordinate their operations along the above lines.

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

Frequency spectrum in higher bands such as C-band, Ku-band and Ka-band should not be assigned to licensees on an exclusive basis. The widespread use of directional antennas in these higher frequencies means that multiple parties can be granted access rights to use such spectrum, subject to the well-understood international coordination framework for the shared use of such spectrum. There are already multiple satellite systems – in GSO and NGSO – that successfully use the same satellite bands in their

entirety to serve India under the priority and coordination framework of the ITU Radio Regulations.

Granting exclusive rights to satellite spectrum to a single party in India is unnecessary from a technical perspective (as evidenced by the multiple parties successfully using the spectrum today) and incompatible with international practice (as no other country pursues exclusive assignment of satellite spectrum). In addition, exclusive assignment would disrupt existing services if someone other than the existing spectrum user were to win exclusive rights to the spectrum at auction or if the auction were to result in higher spectrum costs for existing users. Even worse, the exclusive assignment would severely and artificially limit the availability (and inherent capabilities) of new and competitive satellite services in India, as only a few parties will have access to the spectrum in India to the exclusion of all others, which could also make use of the same spectrum to provide additional and competitive services. In its most extreme form, exclusive assignment would lead to a monopoly in a given satellite spectrum band without any countervailing benefit. Such outcomes would defeat the goal of India's new Space Policy to increase private participation in India's space sector and the purpose of India's National Digital Communications Policy to accelerate the deployment of universal broadband.

There is no good policy reason to put satellite spectrum into the hands of a single party or just a few parties when that spectrum is technically capable of being used by multiple parties in India under well-established principles of international law. If India wants to encourage private participation in the Indian space sector and wants to avail itself of the full range of new and competitive satellite offerings available, then there are strong policy reasons to avoid artificially creating spectrum "gatekeepers" and "monopolists" through exclusive assignment methods such as auctions.

No countries use an auction to assign satellite spectrum in the higher frequency ranges (e.g. C-band, Ku-band, Ka-band) on an exclusive basis. As acknowledged by TRAI, three countries have tried a form of competitive allocation in connection with some (but not all) satellite orbital resources (Brazil, Mexico, and the United States). All of them have since abandoned auctions in favour of administrative assignment, as they found

that auctions were not practicable and did not promote robust competition in their satellite markets. Even in countries that did auction some of their orbital resources at some point in time, satellite operators seeking market access using foreign orbital resources in the same frequency band could still obtain access to such spectrum on an administrative basis to provide services into the country.

Saudi Arabia's recent auction of certain S-band spectrum is an outlier, as the satellite spectrum in question could later be "upgraded" to terrestrial use. All of the spectrum was won by Saudi Telecom, a deep-pocketed mobile operator, effectively precluding potential competition from two international MSS operators in the S-band (EchoStar and Omnispace) and Salam (a satellite JV with Iridium, AST Space Mobile and Airbus). This is not the kind of result that India should want to invite in what would otherwise be a competitive FSS and MSS satellite market. Other countries have successfully assigned the S-band MSS spectrum by the administrative process.

For these reasons, India should assign satellite spectrum on a non-exclusive basis by administrative assignment, as it has done in the past and as all other countries are doing today globally. It is neither necessary nor desirable to adopt an exclusive assignment approach (e.g. by auction) as such this approach would be disruptive to existing services. It would unnecessarily limit the introduction of new competition and new satellite technologies into India.

**Q5. In case it is decided to assign spectrum in higher frequency bands such as C band, Ku band and Ka band for space-based communication services to licensees on an exclusive basis,**

**(a) What should be the block size, minimum number of blocks for bidding and spectrum cap per bidder? Response may be provided separately for each spectrum band.**

As explained above, exclusive assignment is technically unnecessary and likely to lead to unfavourable policy outcomes (see responses to Q2 and Q4(d)). In most cases, especially in the latest HTS and software-defined satellites, the full frequency range will be embarked on each satellite system because the full frequency range can be

re-used under the ITU framework. Artificially assigning satellite spectrum in small blocks is only likely to lead to inefficient fragmentation of satellite spectrum, degraded throughput, and/or inability of satellite operators to deploy at their full capabilities (or at all) in India.

SIA-India notes that terrestrial mobile communications are developed, planned or deployed in a different manner than space-based communications. The characteristics of frequency carriers, equipment design and mobile network planning are conflated with space services' spectrum use in this question. For example, where TRAI wishes to identify a minimum spectrum "block size" and "minimum number of blocks", we note that satellite frequency use is not implemented through the aggregation of standardised frequency carriers or waveforms as found in IMT standards such as 3GPP. Furthermore, satellite spectrum availability has direct proportionality with the number of users than can be served by a satellite network (which is a fixed design, hence the importance of spectrum availability and harmonization of the bands allocated to satellite services by WRCs).

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

The ITU-R Radio Regulations provide a well-understood international framework of priority and coordination for sharing between satellite systems. The framework governs sharing between GSO systems (based on date priority and coordination triggers), between NGSO and GSO systems (e.g. in the form of EPFD limits at the geostationary arc in most bands), and between NGSO systems (based on the date priority, coordination, and the sharing techniques discussed in response to Q3 above).

The fact that an intra-service sharing framework already exists at the ITU-R level and can easily be adapted for India demonstrates that there is no need to assign satellite spectrum in India on an exclusive basis. Indeed, by adopting well-understood intra-

service sharing rules, the assignment of satellite spectrum will be unrestricted, and it becomes very difficult to see any point in conducting an auction.

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

The ITU framework for frequency coordination among multiple satellite systems provides a solid basis for enabling shared use of satellite spectrum in India. The main elements of the ITU framework are: (1) a requirement to protect earlier filed satellite networks from harmful interference, and (2) EPFD limits to protect GSO systems from NGSO systems in the applicable frequency bands (ITU Radio Regulations, Art. 22). The ITU framework is constantly being refined, however, and India should ensure that its satellite sharing rules take into account the latest thinking at the international level.

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

Today, ISRO's satellites, as well as foreign satellites that have been made part of the INSAT system, are using and re-using C-band, Ku-band and Ka-band spectrum to serve end users in India. Introducing a new system of exclusive satellite spectrum assignment would be highly disruptive to existing users of this spectrum, especially if the system leads to someone other than the existing spectrum users gaining exclusive rights to that spectrum. Any new assignment system must therefore be carefully crafted to ensure the continuity of existing services.

However, as soon as a system of sharing spectrum with existing satellite spectrum users is introduced, e.g. based on ITU rules, questions will naturally arise as to why the exclusive assignment is necessary at all (it is not) and why the sharing rules could not be used to accommodate future entry (they can). Moreover, an exception to

exclusive assignment to accommodate existing users will not solve other problems associated with or created by an exclusive assignment that would not otherwise exist or be material (see responses to Questions below). With a system of exclusive assignment, there is a strong likelihood that new satellite operators, new satellite services and/or new satellite technologies in India would be precluded altogether or would only be available by agreement with the exclusive spectrum holder.

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

- (a) Whether such entity should take part in the next auction/ assignment cycle after expiry of the validity period of the assigned spectrum? If yes, what should be the validity period of the auctioned/assigned spectrum?**
- (b) Whether spectrum acquired through auction be permitted to be shared with any entity which does not hold spectrum/ or has not been successful in auction in the said band? If yes, what measures should be taken to ensure rationale of spectrum auction and to avoid adverse impact on the dynamics of the spectrum auction?**
- (c) In case an auction based on exclusive assignment is held in a spectrum band, whether the same spectrum may again be put to auction after certain number of years to any new entrant including the entities which could not acquire spectrum in the previous auction? If yes,**
  - (i) After how many years the same spectrum band should be put to auction for the potential bidders?**
  - (ii) What should be the validity of spectrum for the first conducted auction in a band? Whether the validity period for the subsequent auctions in that band should be co-terminus with the validity period of the first held auction?**

**Kindly justify your response.**

As explained in the responses to previous questions, exclusive assignment is technically unnecessary and likely to lead to unfavourable policy outcomes. This question (Q6) illustrates just some of the regulatory problems that a system of exclusive assignment would create. Specifically, rules would have to be devised to enable future entry after an exclusive assignment of satellite spectrum. Such problems are trivial under a system of non-exclusive assignment based on the ITU Radio Regulations, which has provided enough certainty and flexibility to enable multiple operators around the world – old and new – to make substantial investments in innovative satellite systems.

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

This question (Q7) illustrates yet another set of regulatory problems that would be created by a system of exclusive assignment – whether to allow secondary transactions and how to ensure auction integrity. Once again, such problems are non-existent or trivial under a system of non-exclusive assignment based on the ITU Radio Regulations, which has provided enough certainty and flexibility to enable multiple operators around the world – old and new – to make substantial investments in innovative satellite systems. As explained in the responses to previous questions, exclusive assignment is technically unnecessary and likely to lead to unfavourable policy outcomes.

**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 explained in the responses to Q5, introducing a new system of exclusive satellite spectrum assignment would be highly disruptive to existing users of this spectrum, especially if the system leads to someone other than the existing spectrum users gaining exclusive rights to that spectrum. Any new assignment system must therefore be carefully crafted to ensure the continuity of existing services.

Intra-band sharing rules among satellite systems do exist in the form of the ITU framework. With a system of exclusive assignment, there is a strong likelihood that existing satellite spectrum users will not be able to grow; and that new satellite operators, new satellite services and/or new satellite technologies in India would will be precluded altogether or would will only be available by agreement with the exclusive spectrum holder. This raises questions as to why the exclusive assignment is necessary at all (it is not) and why the same sharing rules could not be used to be accommodate future entry (they can).

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

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

**(b) Any other suggestions may kindly be made with detailed justification.**

**Kindly justify your response.**

As explained in responses to previous questions, the ITU Radio Regulations provide a well-understood international framework for spectrum sharing among satellite operators. Features of the ITU framework for satellite spectrum sharing include (1) protection of earlier-filed satellite networks coupled with a coordination procedure (e.g. in GSO-to-GSO and NGSO-to-NGSO), (2) EPFD limits for the protection of GSO from NGSO satellites in the applicable bands (see ITU Radio Regulations, Art. 22), and (3) regulatory deadlines for bringing satellite spectrum into use.

Typically, countries have adopted the ITU framework as the basis for domestic satellite licensing and regulation with minimal modification without auctions.<sup>1</sup> No countries assign satellite spectrum in the higher frequency bands, on an exclusive basis – see response to Q4 above. Implementing ITU-R based satellite regulations worldwide has enabled multiple satellite operators – both old and new – from multiple countries to make substantial investments in innovative satellite systems. In contrast, a system of exclusive assignments will likely stifle competitive entry and innovation and result in fewer competing satellite services being available in India. Suppose India wishes to avail itself of the burgeoning competition and innovations taking place in the global satellite industry, and to encourage domestic players to participate in that industry. In that case, it should adopt a domestic regulatory regime that is grounded in the ITU framework.

**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.**

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<sup>1</sup> See, e.g., UK OFCOM, Procedures for the Management of Satellite Filings (March 2019), [https://www.ofcom.org.uk/data/assets/pdf\\_file/0022/140926/new-procedures-1.pdf](https://www.ofcom.org.uk/data/assets/pdf_file/0022/140926/new-procedures-1.pdf); Code des postes et des communications électroniques (France), Art. R52-3-1, at <https://www.legifrance.gouv.fr/codes/id/LEGIARTI000006466514/2006-08-12>; Telekommunikationsgesetz (Germany), § 95, at [https://www.gesetze-im-internet.de/tkg\\_2021/\\_95.html](https://www.gesetze-im-internet.de/tkg_2021/_95.html); ACMA, Set up and operate a new satellite network, <https://www.acma.gov.au/set-and-operate-new-satellite-network>.

The 27.5-28.5 GHz band should not be made available for IMT or flexible use, but should be reserved for satellite services. There is no global or regional identification of this band for IMT, and most countries in the world use this band for Ka-band satellite services.

Indeed, satellite demand, investments, and deployments in the 27.5-28.5 GHz band have been strong and sustained over many years. In just the last 10 years, thousands of new, innovative satellite systems using this band – both GSO and NGSO – have been launched. It is part of the core Ka-band uplink band used in HTS systems launched by Inmarsat (e.g. Global Xpress), ISRO (e.g. **GSAT 11, GSAT 19, GSAT-20, GSAT-29**), OneWeb, SES (SES-12, O3b/mPOWER), and Starlink, and is a cornerstone of upcoming HTS systems such as Amazon Kuiper, Telesat Lightspeed, and ViaSat-3. Losing full use of half of the 27.5-29.5 GHz band to a “flexible use” or IMT allocation would seriously impair the overall throughput and capabilities of all of these satellite systems and preclude India from enjoying the many benefits of the many new Ka-band GSO and NGSO HTS systems (including ISRO satellites) that make use of this band.

This impairment to Ka-band satellite services in India will be without any countervailing benefit. India has already auctioned 3250 MHz in the 24.25-27.5 GHz (“26 GHz”) band for IMT (over 51,000 MHz across all markets) to four leading mobile network operators. That amount of spectrum is more than enough to support any possible potential 5G application that may develop in the millimetre wave bands, as not all of the spectrum made available was taken up during the 26 GHz auction. In fact, there is mounting evidence from around the world that the business case for IMT in these high frequencies is uncertain, given the short range and highly increased capital requirements for deployments in such bands. There is thus no reason to assign more.

In December 2022, South Korea – a leading proponent of 5G in the millimetre wave bands – cancelled two of three 26/28 GHz 5G licenses for failure to meet buildout

requirements.<sup>2</sup> The third Korean licensee, SK Telecom, recently announced that it would stop using the 28 GHz for 5G after building around 1600 base stations nationwide.<sup>3</sup> It reportedly said, “It is practically impossible to utilize 28 GHz for business-to-consumer (B2C) transactions.” In effect, this band has not been used for 5G or satellite services in South Korea for the five years since the band was auctioned. Similarly, in Europe, the 5G Observatory has noted a “lack of demand” for the 26 GHz band and found that “although initially, the mmWave bands proved popular, with the US and Japan leading the world in making them available, their popularity had now waned.”<sup>4</sup> In the United States, data from OpenSignal in October 2021 (three years after the spectrum auction) showed that U.S. 5G handsets were connected to a millimetre wave network less than 1% of the time.<sup>5</sup> Similarly, in Japan, which made much of the 28 GHz band available for 5G millimetre wave services in 2019, a March 2022 survey by the Ministry of Internal Affairs and Communications found that “As for the millimetre wave band, the number of stations is small, the coverage rate is 0.0%, and the amount of traffic processed is almost nonexistent, so its use is limited.”<sup>6</sup> The slow rollouts and limited traffic for 26 GHz and 28 GHz deployments is prompting a rethink in Japan and South Korea. An official from Japan’s Ministry of Internal Affairs and Communications (MIC), while speaking at the recent 9th Asia-Pacific Spectrum Management Conference, explained how little 28 GHz has contributed to 5G deployment.

India will benefit more from maintaining a harmonised Ka band, as this band has emerged as the global choice for Ultra High Throughput Satellite systems, particularly for ubiquitous FSS and ESIM use.

In sum, the evidence from other countries strongly indicates that a cost-benefit analysis would favour keeping this band for satellite instead of assigning it for IMT or

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<sup>2</sup> Cho Mu-Hyun, *South Korea cancels 5G 28GHz spectrum allocation to telcos due to 'lack of spending'*, <https://www.zdnet.com/article/south-korea-cancels-5g-28ghz-spectrum-allocation-to-telcos-due-to-lack-of-spending/>.

<sup>3</sup> SK Telecom to Stop Using 28 GHz Band for 5G: Report, <https://telecomtalk.info/sktelecom-stop-using-28ghz-band-for-5g/701822/>.

<sup>4</sup> <https://5gobservatory.eu/26-ghz-holds-back-achievement-of-eu-5g-goals/>

<sup>5</sup> <https://www.opensignal.com/2021/10/14/quantifying-the-mmwave-5g-experience-in-the-us-october-update>.

<sup>6</sup> See [https://www.soumu.go.jp/main\\_content/000860636.pdf](https://www.soumu.go.jp/main_content/000860636.pdf) (translated from Japanese using Microsoft Word Translator).

“flexible use”, especially when ample other, globally harmonized spectrum band has already been assigned for exclusive IMT use in the 26 GHz.

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

As explained in the response to Q10, the 27.5-28.5 GHz band should be reserved for satellite use, and not for IMT or “flexible use”.

SIA-India has previously explained in prior consultations on this issue before TRAI that terrestrial IMT/5G services are designed to be different from satellite services in co-frequency/ co-coverage. For India to be able to enjoy the benefits of both satellite broadband services and terrestrial IMT/5G, TRAI should allocate the 28 GHz band exclusively for satellite services and identify other frequency bands (e.g., 26 GHz band) which have been globally harmonized for terrestrial IMT/5G.

The frequency range of the band identified for 5G/IMT by the ITU-R at WRC-19 is 24.25-27.5 GHz (known as the 26 GHz band), among other mmWave bands<sup>7</sup>. The ITU-R does not identify spectrum in the 27.5-29.5 GHz band for 5G/IMT. In addition, the band 27.5-29.5 GHz has been protected by the ITU-R for satellite broadband services, including earth stations in motion (ESIM) at WRC-19<sup>8</sup>, and is under study for expanded satellite use in WRC-23 Agenda Items 1.16 (non-geostationary ESIM) and 1.17 (satellite-to-satellite links).

The ITU-R Radio Regulations (RR), in accordance with No.31 of ITU’s Constitution, is a binding international treaty document. Publications, including recommendations by

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<sup>7</sup> See ITU Press Release, *WRC-19 identifies additional frequency bands for 5G*, (22 Nov. 2020) (those bands include the following: 24.25-27.5 GHz, 37-43.5 GHz, 45.5-47 GHz, 47.2-48.2 and 66-71 GHz), <https://news.itu.int/wrc-19-agrees-to-identify-new-frequency-bands-for-5g/>.

<sup>8</sup> See ITU Radio Regulations, adopting Footnote 5.517A authorizing geostationary ESIM as a part of the Fixed Satellite Service in the 27.5-29.5 GHz and 17.7-19.7 GHz bands.

the ITU-R, focus on optimizing and providing guidelines for spectrum use by its 193 member administrations of the ITU. For example, the ITU-R adopted Recommendation ITU-R S. 2223 on “Technical and operational requirements for GSO FSS earth stations on mobile platforms in bands from 17.3-30 GHz” in 2011 and then updated it in 2016<sup>9</sup>. Given India’s ratification of the ITU-R Radio Regulations, it is in India’s interest to act in coherence with its ITU-R work, positions and resources that have been invested globally by harmonizing 27.5-28.5 GHz domestically with its participation at the ITU-R activities. As explained in response to Q10 above, the vast majority of countries have elected to use this band for FSS, including ESIMs and to put 5G/IMT services in the globally harmonized 26 GHz. The few countries that have attempted to use the band for “flexible use” or IMT (South Korea, the U.S. and Japan) have seen limited terrestrial deployments, which means that the band has essentially not been used for either satellite or 5G over the last 4-5 years.

In contrast, satellite operators have made substantial investments in the 28 GHz band based on the global validation of satellite broadband use of the band at both WRC-15 and WRC-19. The decisions of these Conferences provided confidence for those investments, and the result is that satellite networks are being built and deployed around the world for extensive use of the 28 GHz band, using the globally shared spectrum coordination process managed by the ITU-R.

For these reasons, India should not introduce “flexible use” or IMT services in the 27.5-28.5 GHz band and should instead reserve it for satellite services. Ka-band satellite services using this band will help close the digital divide across India while introducing “flexible use”, or IMT is unlikely to lead to significant deployment (as the experience in other countries has shown).

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<sup>9</sup> See ITU-R Recommendation S.2223, *Technical and operational requirements for GSO FSS earth stations on mobile platforms in bands from 17.3-30 GHz* (2011, revised 2016), <https://www.itu.int/pub/R-REP-S.2223>.

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

There is no requirement for permitting flexible use between CNPN and space-based communications services in the frequency range 28.5-29.5 GHz. As with the 27.5-28.5 GHz band, the 28.5-29.5 GHz band should be reserved for satellite services. This band is also part of the Ka-band uplink spectrum deployed on most of the latest GSO and NGSO HTS systems – see the response to Q10 above – and allowing CNPN “flexible use” in this band would impair even more the throughput and overall capabilities of these innovative satellite systems to provide service to India.

It appears in this Consultation Paper that TRAI, in its previous recommendations dated November 2022, had already proposed to identify 400 MHz for CNPN, which can coexist with satellite earth stations. If implemented, this would leave just 600 MHz (or 30%) of the 27.5-29.5 GHz Ka-band uplink band for satellite systems. This alone would severely impair the overall throughput of the latest HTS systems and unnecessarily limit the amount of bandwidth available to provide services in India. However, even less spectrum may be available if this 600 MHz of satellite spectrum were to be auctioned exclusively, rather than shared per ITU principles. As explained in responses to previous questions, exclusive assignment of satellite spectrum will almost certainly result in many fewer satellite systems providing competitive service in India and preclude new satellite services and technologies from being enjoyed in India, except through arrangement with the exclusive spectrum holder.

Public 5G networks have “network slicing” capabilities that be used to deploy a localized private network for enterprise purposes. Public 5G networks have “network slicing” capabilities that be used to deploy a localized private network for enterprise purposes. Public 5G networks have “network slicing” capabilities that be used to deploy a localized private network for enterprise purposes. The case for reserving 400 MHz of Ka-band spectrum available for CNPN (at the expense of satellite services) is further weakened by the fact that the demand for private networks can be met using the spectrum that has already been auctioned for public 5G. The case for reserving

400 MHz of Ka-band spectrum available for CNPN (at the expense of satellite services) is further weakened by the fact that the demand for private networks can be met using the spectrum that has already been auctioned for public 5G. The case for reserving 400 MHz of Ka-band spectrum available for CNPN (at the expense of satellite services) is further weakened by the fact that the demand for private networks can be met using the spectrum that has already been auctioned for public 5G. Many enterprises looking to deploy a CNPN will need to engage the services of a technical specialist (such as an MNO) even if it to could secure a separate spectrum for this purpose. It would likely be just as, if not more efficient, for the enterprise customer to use the MNO's spectrum resources for CNPN service than to go to the trouble of obtaining separate license of its own.

If India wants to take advantage of all the latest developments and innovations in the global satellite industry, it must preserve the entire 27.5-29.5 GHz band for satellite services. Satellites using this spectrum will be essential for accelerating India's policy goals of providing "broadband for all". Indeed, satellites have utilized this band in other countries to deliver ubiquitous broadband and to expand 4G and 5G networks.<sup>10</sup> In contrast, evidence from other countries indicate that taking this spectrum away from satellite (e.g. South Korea) or introducing a "flexible use" regime (e.g. U.S. and Australia) will result in only limited additional terrestrial service. Thus, India has far more to gain by reserving the 27.5-29.5 GHz band for satellite use (assigned on an administrative, non-exclusive basis) than by dedicating the band for IMT, CNPN or "flexible use."

**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.**

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<sup>10</sup> See, e.g., <https://www.ses.com/press-release/ses-and-vodafone-png-join-forces-deliver-4g-and-future-5g-services-satellite-papua>.

As the response to Q12 explained, the 28.5-29.5 GHz band should be reserved for satellite services. The case for a dedicated 400 MHz for CNPN in the 28.5-29.5 GHz band at the expense of satellite services is particularly weak, given the other IMT-exclusive spectrum that could be used to meet CNPN demand, and the significant benefits from extensive satellite use of the band. In contrast, evidence from countries like South Korea suggests that the additional terrestrial services are likely to be deployed in the 27.5-29.5 GHz band could be quite limited. Moreover, the MNOs can meet the demand for CNPN using the IMT-exclusive spectrum (e.g. 26 GHz) that has already been auctioned. The challenges associated with a “flexible use” regime between CNPN and satellite communications would be the same as those between IMT and satellite communications. As explained above, a cost-benefit analysis favours reserving the entire 27.5-29.5 GHz for satellite services (which will help close the digital divide) then setting any of it aside for CNPN, IMT or “flexible use” (consistent with the experience in other countries).

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

As explained in response to Q2 above, satellite spectrum allocations can be used for both gateways and/or user links, subject to any restrictions in the NFAP (e.g. spectrum reserved for feeder links). Satellite spectrum allocations are also inherently flexible and can be used for the full range of communications services (e.g. Internet, VSAT, DTH, IFMC, etc.). The same spectrum can be used for DTH on one satellite and for Internet access or mobile backhaul on another satellite, and the actual application on a given satellite can change over time depending on customer demand. It would thus be artificial to categorise satellite spectrum for different classes of service.

As a result, there is no basis for a different method of assignment for different classes of satellite services. As explained in detail in the responses to other questions, satellite spectrum should be assigned by administrative process on a non-exclusive basis based on the framework of the ITU radio Regulations. This is the predominant

practice in virtually all countries and all satellite frequency bands. The one recent exception is Saudi Arabia’s auction of the S-band “NTN” spectrum, but that is an outlier (see response to Q4 above). Saudi Arabia has not, and does not, use auctions for the assignment of other satellite bands.

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

Not applicable.

**Please provide the following details:**

- a) Service provider-wise details regarding financial and market parameters such as total revenue, total subscriber base, total capital expenditure etc., for each type of service (as mentioned in the Table 1.3 of this consultation paper) for the financial year 2018-19, 2019-20, 2020-21, 2021-22, and 2022-23 in the format given below:**

<b>Type of service: _____</b>				
<b>Financial Year</b>	<b>Revenue (Rs. lakh)</b>	<b>Subscriber base</b>	<b>CAPEX for the year (Rs. lakh)</b>	<b>Depreciation for the year (Rs. lakh)</b>
<b>2018-19</b>				
<b>2019-20</b>				
<b>2020-21</b>				
<b>2021-22</b>				
<b>2022-23</b>				

- b) Projections on revenue, subscriber base and capital expenditure for each type of service (as mentioned in the Table 1.3 of this consultation paper) for the whole industry for the next five years starting from financial year 2023-24, in the format given below:**

<b>Type of service: _____</b>			
<b>Financial Year</b>	<b>Revenue (Rs. lakh)</b>	<b>Subscriber base</b>	<b>CAPEX for the year (Rs. lakh)</b>
<b>2023-24</b>			
<b>2024-25</b>			
<b>2025-26</b>			
<b>2026-27</b>			
<b>2027-28</b>			

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

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

**Please provide your response with detailed justification.**

The spectrum assignment for user links for L-band and S-band MSS should be by the administrative process. The use of small, omnidirectional antennas in these MSS bands makes re-use difficult, and band segmentation is joint among multiple operators in the L- and S-band MSS operators. But that does not mean that auctions are required to assign such a spectrum. The administrative assignment is the predominant practice for assigning L- and S-band user link spectrum in the international community. Indeed, even the United States, which previously auctioned certain satellite bands before abandoning the practice, has not assigned L- and S-band MSS spectrum by auction. Instead, in the L-band, the FCC issued licenses administratively while relying on established international coordination mechanisms to determine how much spectrum each operator could use. In the S-band, the FCC used a processing round to identify interested parties and to divide the spectrum among the interested parties without the need for an auction. While Saudi Arabia recently auctioned the S-band "NTN" spectrum, that was an outlier (see response to

Q4 above). Saudi Arabia has not and does not, use auctions for the assignment of other satellite bands.

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

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

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

The spectrum assignment for user links in higher bands like C-band, Ku-band and Ka-band should be by the administrative process. As explained in response to Q4, the widespread use of directional antennas in these higher frequencies means that multiple parties can be granted access rights to use such spectrum, subject to the well-understood international coordination framework for the shared use of such spectrum. Unsurprisingly, administrative assignment is the predominant practice of virtually all countries in these higher frequency bands – see the response to Q4 above.

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

Spectrum for satellite user links should be assigned administratively on a non-exclusive basis and at the national level. Such an approach ensures that the full capabilities of the latest satellite technologies can be utilized throughout India. Satellite beams have the advantage of being able to cover large areas and connect distant points, and this should be unrestricted by sub-national territorial licensing. While satellite beams can be shaped, it needs to make sense to license satellite user links by reference to sub-national boundaries devised for terrestrial services.

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

Separate auctions of user link spectrum for each type of service should not be conducted. As explained in response to previous questions: (1) the exclusive assignment of satellite spectrum, e.g. by auction, would lead to many adverse policy outcomes for India that cannot be ameliorated; and (2) satellite bands can be used for the full range of communications services, so it would be artificial to distinguish between different types of services that a given frequency band can support. Holding separate auctions for satellite user link spectrum for different kinds of services makes no sense when the satellite spectrum in question can be flexibly used for user links or gateway links and in any type of communications service, as the occasion requires. Doing so would only lead to extreme fragmentation of inherently flexible satellite spectrum and make it difficult for satellite operators or service providers to assemble all of the gateway and user link spectrum licenses required to provide any given service or a full range of services.

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

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

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

The assignment of satellite spectrum for gateway links should be by the administrative process. The administrative assignment is the predominant method by which virtually all countries assign satellite spectrum – see the response to Q4 above.

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

Separate auctions of gateway link spectrum for each type of service should not be conducted. As explained in response to previous questions: (1) the exclusive assignment of satellite spectrum, e.g. by auction, would lead to many negative policy outcomes for India that cannot be ameliorated; and (2) satellite bands can be used for the full range of communications services, so it would be artificial to distinguish between different types of services that a given frequency band can support.

Holding separate auctions of satellite gateway link spectrum for different kinds of services makes no sense when the satellite spectrum in question can be flexibly used for user links or gateway links any communications service, as the occasion requires. Satellite gateways can efficiently support more than one kind of communications service, e.g. VSATs and IFMC and DTH, and operators need to be able to access the relevant uplink and downlink spectrum combinations that correspond to the satellite system in question. Auctioning satellite gateway spectrum separately on a service-by-service basis would lead to inefficient gateway deployments and/or extreme fragmentation of inherently flexible satellite spectrum and make it difficult for satellite operators or service providers to assemble all of the spectrum licenses required to provide any given service, or to offer a full range of services.

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

- (a) What should be the validity period of the auctioned spectrum?**
- (b) What should be the periodicity of the auction for any unsold/ available spectrum?**
- (c) Whether some mechanism needs to be put in place to permit the service licensee to shift to another satellite system and to change the frequency spectrum within a frequency band (such as Ka-**

**band, Ku-band, etc.) or across frequency bands for the remaining validity period of the spectrum held by it? If yes, what process should be adopted and whether some fee should be charged for this purpose?**

**Kindly justify your response.**

As explained in the responses to previous questions, exclusive assignment of satellite spectrum, such as by auction, is technically unnecessary and will lead to negative policy outcomes that cannot be ameliorated. This question (Q21) further illustrates some of the regulatory problems that would be created by a system of exclusive assignment, namely the inflexibility created by exclusive licensing and the need to create rules for service licensees seeking to switch providers (an essential component of the market competition) in the face of an exclusive licensee. Such problems do not exist or are trivial under a system of non-exclusive assignment.

In the United States, for example, administratively issued earth station licenses routinely authorise the use of given frequencies with multiple satellites so that the service provider holding the license can easily switch between different satellite operators. India's licensing system is less flexible today due to the need to procure satellite capacity through NewSpace India Limited ("NSIL"), but exclusive licensing of satellite spectrum threatens to stifle competition by making switch providers (and frequencies) even more difficult. This problem is best avoided by not requiring auctions of satellite spectrum.

**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.**

As explained in the responses to previous questions, exclusive assignment of satellite spectrum, such as by auction, is technically unnecessary and will lead to negative policy outcomes that cannot be ameliorated. This question (Q22) further illustrates the complications created by auctioning satellite spectrum separately for gateway links, user links (and different classes of service). As the question acknowledges, fragmenting the assignment of satellite spectrum into the gateway and user link spectrum combined with exclusive assignment creates a risk that a satellite operator with a functioning system or a service provider seeking to use a particular system cannot assemble the right combination of spectrum licenses necessary to operate its system or its service due to inability to secure the right gateway spectrum, user link spectrum, and/or service-specific spectrum. These issues do not arise or are trivial in countries where satellite spectrum is assigned administratively on a non-exclusive basis.

Instead of licensing by the gateway and or user link spectrum by exclusive auction, India should look to the regulatory practice of other countries. In virtually all countries, operators and service providers can obtain satellite spectrum licenses for space stations and/or earth stations on a non-exclusive basis, subject to a requirement to protect or coordinate with previously assigned stations operating on a primary basis. The earth station license could be for a gateway or user terminal. Coordination with previously assigned stations in the other service may be required

in bands shared with non-satellite services. In bands not shared with non-satellite services, many jurisdictions also offer “blanket licenses” (a single license to allow ubiquitous deployment of multiple terminals) or “license-exempt” regimes (which allow license-free deployment of terminals that meet specific defined parameters). In a few jurisdictions, applicants have the option (but not the obligation) to obtain a license covering both the space and earth stations they plan to deploy.

These various license options exist side-by-side and support the multiplicity of business models prevalent in the satellite industry. For example, some satellite operators prefer to sell capacity to service providers that then on-sell to end users (e.g. ISRO, Intelsat and SES), while other satellite operators prefer to offer integrated satellite capacity and terminal packages (e.g. Inmarsat, Starlink, and ViaSat). Yet other satellite operators pursue a mix of go-to-market strategies. An applicant can choose whichever combination of administrative licenses is most suitable for their business needs. And because satellite spectrum assignments are non-exclusive, there is little to no risk of not being able to obtain the right combination of spectrum for gateways and user 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?**

For co-frequency, co-directional GSO and NGSO earth stations operating in bands subject to ITU-R EFPD limits (see ITU-R Radio Regulations, Art. 22), no protection distance on the ground are necessary to avoid interference. In the EFPD-limited bands, NGSO systems must abide by the EFPD limits specified in the ITU-R Radio Regulations to protect co-frequency GSO systems from unacceptable interference (unless otherwise coordinated).

Outside the EFPD-limited bands covered by Article 22, the GSO or NGSO system with the later ITU-R filing date must protect the earlier-filed GSO or NGSO system or abide

by the coordination agreement that has been completed between the two systems. This is part of the regular coordination between the NGSO and GSO networks, and a regulatory rule setting a mandatory protection distance is not necessary. Similarly, coexistence between NGSO gateways can also be ensured by considering the agreed interference criterion and the technical characteristics of the systems involved as part of the overall system coordination.

**Q24. What should be the eligibility conditions for assignment of spectrum for each type of space-based communication service (as mentioned in the Table 1.3 of this Consultation Paper)? Among other things, please provide your inputs with respect to the following eligibility conditions:**

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

**Kindly justify your response**

As explained in the responses to previous questions, India should only assign satellite spectrum by an equal assignment (e.g. by auction) or by the different classes of service in Table 1.3 of the Consultation Paper. Satellite spectrum can be used to support the full range of communications services. It follows that the eligibility criteria and the method for assigning spectrum should remain the same according to the type of service in Table 1.3 that is contemplated.

**For satellite operators**, the eligibility criteria for obtaining DoT spectrum assignments should be at most what IN-SPACE would require for the issuance of space authorizations. A satellite operator should be eligible to apply for satellite spectrum for its satellite system if:

- It (or its affiliate) has applied for or obtained the necessary Indian ITU filing(s) and IN-SPACE authorization to use the Indian orbital resources associated with its system. Some integration of the IN-SPACE and DoT licensing processes will be necessary and should be made transparent.

- It (or its affiliate) holds the foreign ITU filing(s) under which it operates, and has applied for or obtained the necessary IN-SPACE authorization to use the non-Indian orbital resources associated with its system. Some integration of the IN-SPACE and DoT licensing processes will be required and should be made transparent.

No minimum net worth or other financial qualification should be necessary beyond what is required for the IN-SPACE application. No Unified Licence or other DoT or MIB licence is required for the satellite operator to obtain the satellite spectrum license for its satellite system. However, some party (either the satellite operator or its customer) will need to get the necessary DoT or MIB license before that entity can begin providing the licensed service to the public using that satellite system. In the case of a satellite operator, an existing agreement with the satellite operator should not be necessary, except for exclusive assignment of spectrum (which is not recommended).

***In the case of a service provider,*** it should be eligible to apply for satellite spectrum to provide services using a particular satellite system if:

- It (or its affiliate) has applied for or obtained the necessary Unified Licence or other DoT or MIB license for the service or services it intends to provide. Some integration between the MIB and DoT licensing processes will be necessary and should be made transparent.
- No minimum net worth or other financial qualification should be necessary beyond what is required for the Unified Licence or other DoT or MIB licence that the service provider has applied for or holds.
- An existing agreement with the satellite operator should not be necessary to apply for spectrum, except in the case of exclusive spectrum assignment (which is not recommended). However, such agreement must be in place before communications with such a system is allowed.

**Q25. What should be the terms and conditions for assignment of frequency spectrum for both user links as well as gateway links for each type of**

**space-based communication service? Among other things, please provide your detailed inputs with respect to roll-out obligations on space-based communication service providers. Kindly provide response for both scenarios viz. exclusive assignment and non-exclusive (shared) assignment with justification.**

As explained in the responses to previous questions, exclusive assignment of satellite spectrum is technically unnecessary and will lead to negative policy outcomes that cannot be ameliorated. In addition, it would be artificial to divide the satellite spectrum into spectrum for gateway links vs. user links or into spectrum for different types of communications.

In the case of satellite spectrum licenses for space stations, the ITU establishes regulatory deadlines for bringing GSO and NGSO satellite filings into use, and unexcused failures to meet such deadlines would result in suppression of the relevant ITU filing and loss of interference protection. In the context of non-exclusive assignments of satellite spectrum, the ITU deadlines should be the only applicable deadline (see, e.g. OFCOM).

Regarding satellite spectrum licenses for earth stations, no roll-out requirements are necessary. Once the satellite system and associated gateway infrastructure are in place, the satellite service has been deployed and is available to end users across the entire coverage area of the satellite; the number of end user terminals that are then deployed depends on customer demand and market conditions. Such an approach makes sense in the case of non-exclusive assignment.

**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.**

The purpose of this underlying restriction on crossholding of equity is to prevent an entity from circumventing spectrum caps and/or controlling too much auctioned "access spectrum". Therefore, the restriction of crossholding of equity in another company with "access spectrum" in the same service area should not be applied to satellite-based service licenses.

Hence, the question of crossholding does not arise, when it is prudent to assign the satellite spectrum (shared only by satcom service providers) administratively on a non-exclusive basis, consistent with the extant regulatory practices in other countries around the world.

**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.**

It is possible to successfully coordinate the interference-free operation of FSS earth stations and individual point-to-point Fixed Service ("FS") microwave links in the same frequency band when both services use directional antennas using the framework and techniques in the ITU-R Radio Regulations. It is much more challenging to ensure interference-free operation between the FSS and IMT, as IMT systems are not designed to share generously with other services. For these reasons, SIA-India would urge India to maintain the footnotes in the NFAP that provide that some satellites are to be "predominantly" used for the FSS and to upgrade them to "exclusive" FSS use so that satellite services can flourish in those bands. As explained in the responses to other questions, attempts to deploy "flexible use" or IMT services in higher satellite bands (such as the 27.5-29.5 GHz band) have been unsuccessful in the countries that have tried this (e.g. in South Korea, the U.S. and Japan). India would be better off making these bands available for exclusive FSS use, including ESIMs, than following the example of these countries.

**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.**

Polarization enables satellite spectrum to be further reused. In a system of administrative assignment, applicants for satellite spectrum should be free to apply for satellite spectrum on any or all polarizations, based on the characteristics of the satellite system or systems they intend to access, without any additional charges being levied.

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

- a. Model #1: Exclusive spectrum assignment**
- b. Model#2: Auction design model based on non-exclusive spectrum assignment to only a limited number of bidders**

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

As explained in responses to question 4 and other questions above, satellite spectrum in higher bands should not be assigned exclusively. Neither auction model would be appropriate as both would result in the artificial exclusion of some users of the satellite spectrum from the Indian market. This would disrupt existing services, leading to fewer competitors, fewer new satellite services, and fewer new technologies in the Indian satellite market.

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

Neither auction model is appropriate for the assignment of satellite spectrum. Both models introduce artificial and unnecessary exclusivity into the assignment of satellite spectrum. As explained above, there is a real risk that either auction model will result in fewer parties being able to offer competitive and innovative satellite services in India as compared with a non-exclusive, administrative method of assigning satellite spectrum. This problem cannot be solved by introducing spectrum trading or other secondary market mechanisms without adding immense regulatory complexity and potential for market abuse. The purpose of Indian telecommunications policy should be to encourage the competitive supply of new satellite services and technologies in India, and it is clear that a non-exclusive administrative method of assigning satellite spectrum is the better means of achieving that goal.

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

**(a) the value of  $\Delta$ , in case it is decided to conduct a combined auction for all services**

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

**Please provide detailed justification.**

This question itself (Q31) illustrates the difficulty in devising a workable auction model. As explained in the response to previous questions, satellite spectrum should not be auctioned using either model #1 or model #2 as both would introduce artificial exclusivity and lead to fewer competitive providers of new satellite services in India. This complexity can be avoided by establishing an administrative process for assigning satellite spectrum on a non-exclusive basis, as virtually all other countries in the world have done.

**Q32. Kindly suggest any other auction design model(s) for user links including the terms and conditions? Kindly provide a detailed**

**response with justification as to how it will satisfy the requirement of fair auction i.e., market discovery of price.**

This question on auction methods focuses on ensuring a “fair auction i.e., market discovery of price” at the expense of the ensuring competitive supply of satellite services in India. As explained in the response to previous questions, satellite spectrum should not be auctioned using any model as doing so would introduce artificial exclusivity and lead to fewer competitive providers of new satellite services in India. What is the point of designing the perfect “fair auction” if the exclusivity created by the auction will result in fewer players being able to offer competitive satellite services and new satellite technologies in India?

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

See responses to Q29-Q32.

**Q34. What could be the likely issues, that may arise, if Option # 2: Assignment of gateway spectrum through auction for identified areas/ regions/ districts is implemented for assignment of spectrum**

**for gateway links? What changes could be made in the proposed option to mitigate any possible issues? In what manner, areas/ regions/ districts should be identified?**

See responses to Q29-Q32.

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

See responses to Q19-20, Q29-Q32.

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

See responses to Q19-20, Q29-Q32.

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

See responses to Q4-Q22, Q29-32.

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 UL's Internet Services Authorization (or ISP License). However, currently, there is no prescribed spectrum charging mechanism for satellite services under the ISP License. We urge the TRAI to address this gap by recommending a spectrum charging model for 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 satellite services under service authorizations with varied scope, such as GMPCS, VSAT CUG and ISP. To efficiently use spectrum, it should be feasible to deploy a single network with 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 ability to use satellite spectrum for multiple kinds of services to enable efficient use of spectrum must still be addressed. It should not be made worse by auctioning spectrum separately for different services.
3. WPC carries out frequency assignments through the issuance of Decision Letters. These letters assign frequencies on a carrier-by-carrier basis, limiting the operational flexibility of modern satellite systems that use dynamic frequency. There will be a significant administrative overhead resulting in delays in deployment of services if the spectrum is to be assigned carrier-by-carrier. Instead, the satellite spectrum should be given as an entire block, and the operator should have the flexibility to dynamically use the frequencies within the given block across different user terminals, gateway stations, and satellites serving India, based on customer requirements, without having to seek WPC approval for every such change.

**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.**

Countries that assign satellite spectrum on an administrative basis use a wide variety of charging mechanisms. Some (e.g. the United States<sup>11</sup> and United Kingdom)<sup>12</sup> take a cost-recovery approach that attempts to recover the administrative cost of licensing from licensees. Others (e.g. Canada<sup>13</sup> and Australia)<sup>14</sup> have implemented charges that vary by the quantum of spectrum licensed. After careful review, the United Kingdom,<sup>15</sup> Australia<sup>16</sup> and Canada<sup>17</sup> have all sought to lower the fees charged for satellite services in recent years by (among other factors) benchmarking their costs against their international peers. India can draw valuable lessons from these other jurisdictions, but should bear in mind India's lower GDP per capita and ensure that the spectrum fee burden is reasonable, invites investment, and is not disproportional to the revenues that service providers can ultimately expect from end users. The TRAI's recent recommendations to adopt a 1% of AGR spectrum fee for a range of satellite services would not be unreasonable.

**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.**

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<sup>11</sup> See FCC, Regulatory Fees ("Sections 6(a) and 9(b) of the Communications Act, as amended, require the Commission to assess and collect regulatory fees every fiscal year to recover the Commission's costs of carrying out its functions."), <https://www.fcc.gov/licensing-databases/fees/regulatory-fees>.

<sup>12</sup> See OFCOM, Statement: Satellite Filings Cost Recovery (2019), <https://www.ofcom.org.uk/consultations-and-statements/category-1/satellite-filings-cost-recovery>.

<sup>13</sup> See ISED, *Decision on Updates to the Licensing and Fee Framework for Earth Stations and Space Stations in Canada*, at § 7 (2022), <https://ised-isde.canada.ca/site/spectrum-management-telecommunications/en/learn-more/key-documents/consultations/decision-updates-licensing-and-fee-framework-earth-stations-and-space-stations-canada>.

<sup>14</sup> See ACMA, *Apparatus license fee schedule* (Mar. 2023), <https://www.acma.gov.au/sites/default/files/2023-03/Apparatus%20licence%20fee%20schedule.pdf>.

<sup>15</sup> See OFCOM, *Consultation: Satellite Filings Cost Recovery*, at A5 and A6 (2018) (surveying and evaluating different charging options), [https://www.ofcom.org.uk/data/assets/pdf\\_file/0027/114966/Satellite-Filings-Cost-Recovery.pdf](https://www.ofcom.org.uk/data/assets/pdf_file/0027/114966/Satellite-Filings-Cost-Recovery.pdf).

<sup>16</sup> See Stan Beer, *ACMA announces tax cuts to satellite services* (25 Jan. 2017), <https://itwire.com/business-it-news/business-technology/acma-announces-tax-cuts-to-satellite-services.html>.

<sup>17</sup> See ISED, *Decision on Updates to the Licensing and Fee Framework for Earth Stations and Space Stations in Canada*, at § 7 (2022), <https://ised-isde.canada.ca/site/spectrum-management-telecommunications/en/learn-more/key-documents/consultations/decision-updates-licensing-and-fee-framework-earth-stations-and-space-stations-canada>.

The auction price paid by a single party to acquire exclusive access to IMT/5G is not a good benchmark for the pricing of satellite spectrum, which can and should be assigned administratively to multiple parties on a non-exclusive basis. Other countries that have recently reviewed their satellite spectrum fees have adjusted (and generally lowered) their satellite spectrum fees based on different principles and considerations, such as cost recovery, the desire to encourage satellite services and investment in the country, and comparisons with the fees charged by their international peers. India should learn from the approach taken by the United States, United Kingdom, Canada, and Australia, of which the latter three have each recently lowered their satellite spectrum fees after careful review – see the response to Q38.

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

Not applicable.

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

**i. For user link**

**ii For gateway link**

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

As explained in responses to previous questions, satellite spectrum should not be assigned exclusively by auction. Instead, satellite spectrum should be assigned administratively on a non-exclusive basis, as is the general practice in virtually the entire world. As explained in response to Q39, the valuation of exclusive spectrum rights in other bands, as determined by auction, cannot be a good benchmark for the valuation of satellite spectrum assigned administratively on a non-exclusive basis.

Adjusting the valuation using an arbitrary spectral efficiency factor does not help. Spectral efficiency is not the only goal of spectrum or telecommunications policy, and privileging or penalizing certain technologies by pricing spectrum based on spectral efficiency alone ignores many other important considerations, such as reach, resilience, cost-effectiveness, and economic viability. For instance, suppose that millimetre wave 5G is more spectrally efficient than Ka-band satellite services. Still, it is economically viable to deploy Ka-band satellite services in rural areas, but not millimetre wave 5G. Should Ka-band satellite services be saddled with higher spectrum prices based solely on spectral efficiency?

In sum, spectral efficiency should not be considered a parameter for any valuation of Space-based communication spectrum.

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

- i. For user link**
- ii. For gateway link**

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

As explained in responses to previous questions, satellite spectrum should not be assigned exclusively by auction. Instead, satellite spectrum should be assigned administratively on a non-exclusive basis, as is the general practice in virtually the entire world. It would be better and simpler just to apply the TRAI recommended 1% AGR fee for the administrative assignment of satellite spectrum on a non-exclusive basis.

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

- i. For user link**

**ii. For gateway link**

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

As explained in responses to previous questions, satellite spectrum should not be assigned exclusively by auction. Instead, satellite spectrum should be assigned administratively on a non-exclusive basis, as is the general practice in virtually the entire world. It would be better and simpler just to apply the TRAI recommended 1% AGR fee for the administrative assignment of satellite spectrum on a non-exclusive basis than to engage in a complicated auction process that will only result in fewer players being able to offer satellite services in India.

**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.**

As explained in responses to previous questions, satellite spectrum should not be assigned on an exclusive basis by auction. Instead, satellite spectrum should be assigned administratively on a non-exclusive basis, as is the general practice in virtually the entire world.

**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.**

As explained in responses to previous questions, satellite spectrum should not be assigned on an exclusive basis by auction. Instead, satellite spectrum should be assigned administratively on a non-exclusive basis, as is the general practice in virtually the entire world. International administrative spectrum charges/ fees should serve as a basis for determining India's administrative costs for assigning satellite spectrum, subject to necessary adjustments to consider cross country differences (see response to Q38).

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

As explained in responses to previous questions, satellite spectrum should not be assigned on an exclusive basis by auction. Instead, satellite spectrum should be assigned administratively on a non-exclusive basis, as is the general practice in virtually the entire world. International administrative spectrum charges/ fees should serve as a basis for determining India's administrative costs for assigning satellite spectrum, subject to necessary adjustments to consider cross country differences (see response to Q38).

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

As explained in responses to previous questions, satellite spectrum should not be assigned on an exclusive basis by auction. Instead, satellite spectrum should be assigned administratively on a non-exclusive basis as is the general practice in virtually the entire world.

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

As explained in responses to previous questions, satellite spectrum should not be assigned on an exclusive basis by auction. Instead, satellite spectrum should be assigned administratively on a non-exclusive basis as is the general practice in virtually the entire world.

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

As explained in responses to previous questions, satellite spectrum should not be assigned on an exclusive basis by auction. Instead, satellite spectrum should be assigned administratively on a non-exclusive basis as is the general practice in virtually the entire world.

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

As explained in responses to previous questions, satellite spectrum should not be assigned on an exclusive basis by auction. Instead, satellite spectrum should be

assigned administratively on a non-exclusive basis as is the general practice in virtually the entire world.

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

As explained in responses to previous questions, satellite spectrum should not be assigned on an exclusive basis by auction. Instead, satellite spectrum should be assigned administratively on a non-exclusive basis as is the general practice in virtually the entire world.

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

As explained in responses to previous questions, satellite spectrum should not be assigned on an exclusive basis by auction. Instead, satellite spectrum should be assigned administratively on a non-exclusive basis as is the general practice in virtually the entire world.

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

As explained in responses to previous questions, satellite spectrum should not be assigned on an exclusive basis by auction. Instead, satellite spectrum should be assigned administratively on a non-exclusive basis as is the general practice in virtually the entire world. Moreover, satellite spectrum can be used for the full range of communications services, and it would be artificial to assign satellite spectrum separately for each type of service.

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

**i. Upfront payment**

**ii. Moratorium period**

**iii. Total number of installments to recover deferred payments**

**iv. Rate of discount in respect of deferred payment and prepayment**

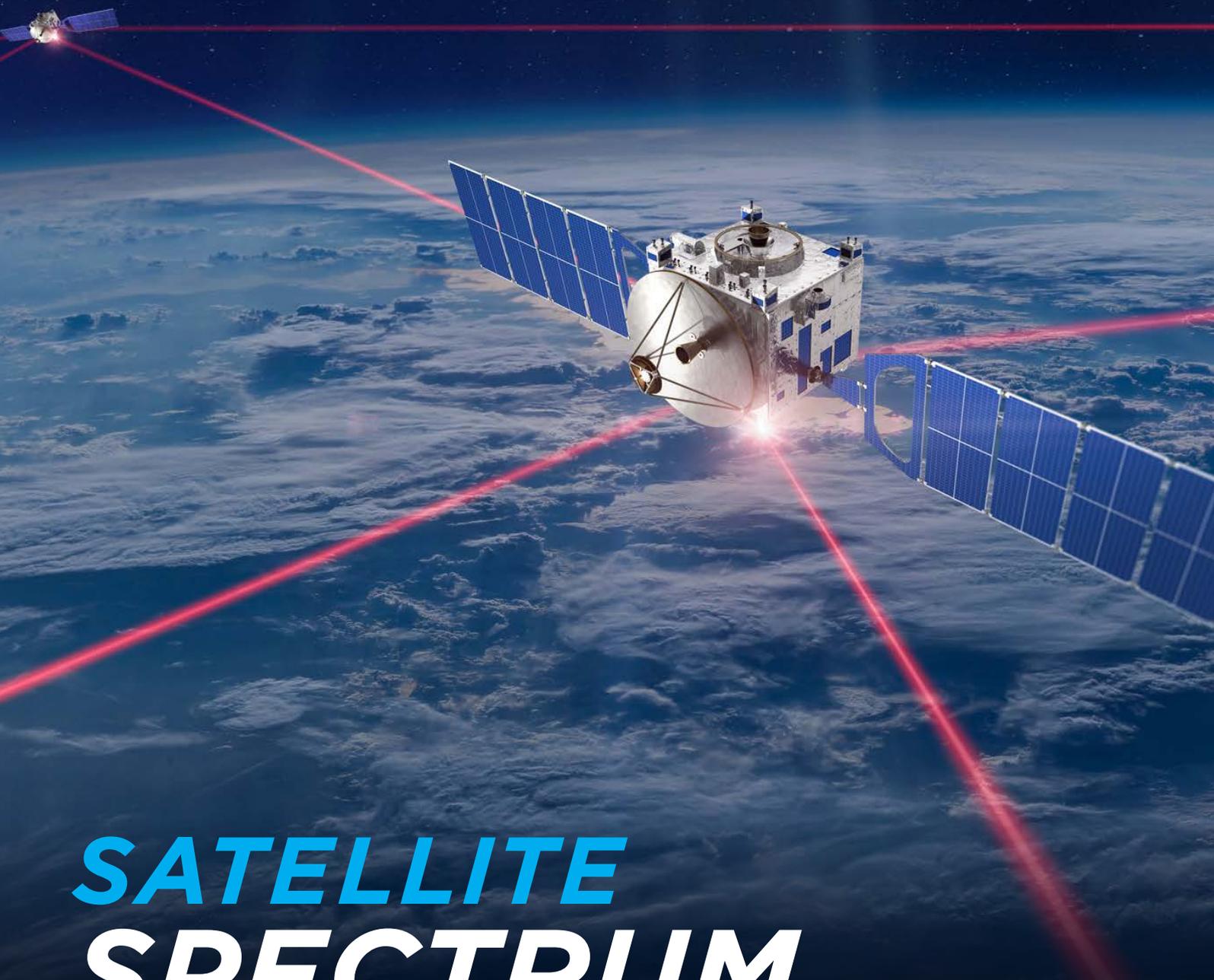
**Please support your answer with detailed justification.**

As explained in responses to previous questions, satellite spectrum should not be assigned on an exclusive basis by auction. Instead, satellite spectrum should be assigned administratively on a non-exclusive basis, which is the general practice followed by all the countries in the entire world. If issued by administrative assignment, satellite spectrum license fees would include a one-off initial and annual fees.

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**SIAINdia**  
Satcom Industry Association



# ***SATELLITE*** **SPECTRUM** **ALLOCATION**

*International Best Practices and Learnings*



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# Preface

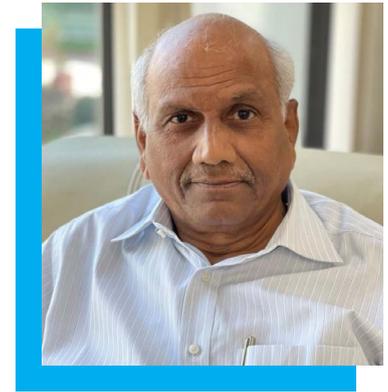
The space and satellite sector in India is undergoing liberalization that allows the private sector to take it to a new horizon. The sector is deemed a 'Sunrise Sector' with emphasis given for adopting supportive policies, we expect that these policies would give impetus to light-touch regulations, facilitative actions to build domestic capacities, and promotion of research & development in the recent budget announcements.

The move to transform the space sector from being government driven to opening the sector to commercial businesses, both Indian and international, in the country's space journey is a revolutionary move by the GOI. The Hon'ble Prime Minister Shri Narendra Modi has envisioned the Space sector to be a revolutionary medium of progress for 1.3 Billion Indians. The Finance Minister Ms. Nirmala Sitharaman has affirmed the key role of private sector participation in the Indian space sector expected to capture a larger share of the global space economy. The Indian space economy aspires for a massive target of cornering 10-15% of market share by 2030 which translates into the space sector becoming a \$50 Billion market. Former ISRO Chief, Dr. K Sivan also had emphasized a 10 fold strengthening of DoS to be able to meet the rising demand.

These ambitious targets of DoS, ISRO and the vision of the GOI are driven by space based industrial capabilities, applications and services that are enabled by a balanced Spectrum Policy. Like any other wireless service, appropriate Spectrum is not just the fundamental prerequisite for the Space communication service providers but is also crucial for ISRO, R&D institutes, manufacturers, academia and startups to carry on their projects seamlessly. India's Space sector has a lot of potential, the space sector is an international phenomenon that needs policies which are well aligned with the International Telecommunication Union [ITU] that supports global harmonization of the spectrum for space activities.

Satellite spectrum-orbital resources, a globally shared public good managed by the ITU, are best suited for administrative licensing as a global best practice. There are no precedents of spectrum assignment by auction to satellite services in any coordinated frequency bands in any country. Out of the 193 ITU member countries, just a negligible number of countries have ever attempted to auction satellite spectrum but later abandoned the practice and replaced it with a globally adopted administrative process.

In the case of terrestrial mobile services, the spectrum is exclusive and is managed only by a single mobile operator in a given geographic area; therefore, this cannot be shared between or amongst operators. While in the case of satellites, the same spectrum is non-exclusive in nature and it can be used by multiple satellite operators to serve the same geographic area. There are hundreds of satellite systems in the geostationary (GSO) and NGSO arc, and several thousands are planned. All these systems will reuse and share the same spectrum.



**Dr. Subba Rao Pavuluri**  
*President, SIA-India &  
CMD, Ananth Technologies Ltd*

Assignment of satellite spectrum by auction would lead to unnecessary segmentation and artificially limit the number of satellite operators sharing the spectrum and encounter technical, legal and economic flaws.

The fact that the satellite spectrum is utilized for the greater public good, in terms of use by govt and private sector such as disaster mitigation, metrology, agriculture, TV channels, public radio, defense and paramilitary forces, aviation, maritime communications, asset tracking, locomotive, ATMs, Gas Stations and list goes on, serving different needs of the society.

This paper brings up various international practices to highlight the best solution for satellite spectrum allocation in India. This whitepaper aims at disseminating the information and bringing rationale on why spectrum for satellite use be allocated administratively as followed in the majority of countries as global best practice. The regulators and policymakers must analyze and evaluate the international trends for an appropriate spectrum allocation mechanism.

Billions of dollars in investment decisions have been taken and several start-ups, MSMEs, and manufacturing industries, and Pvt Companies' business decisions depend on a stable and certain spectrum environment. This also ensures the benefits of satellite capacity from foreign satellite operators to the capacity starved needs of the country.

SatCom Industry Association (SIA-India) therefore brings out this timely whitepaper with the key objective to promote the adoption of a spectrum allocation policy under the administrative route. An Open Sky Policy will help the Satellite operators to have capacity over India and will allow flexibility to the Indian users.

# Executive Summary

Globally, satellite operators do not enjoy exclusive tenure of spectrum rights to deliver services and they are not looking for exclusive rights to spectrum in India either. Satellite spectrum-orbital resources are a globally shared public good managed by the ITU suited for administrative licensing as a global best practice.

For terrestrial mobile services, the spectrum is exclusive and is managed only by a single mobile operator in a given geographic area; therefore, this cannot be shared between or amongst operators. While in the case of satellites, the same spectrum is non-exclusive in nature and it can be used by multiple satellite operators to serve the same geographic area.

In other words, space-based communications use and reuse shared spectrum resources. Any assignment by auction for satellite spectrum that can be shared between operators, such as the C/Ku/Ka bands, would lead to unnecessary segmentation and very inefficient use of spectrum. It would artificially limit the number of satellite operators sharing the spectrum and exclude them from the market.

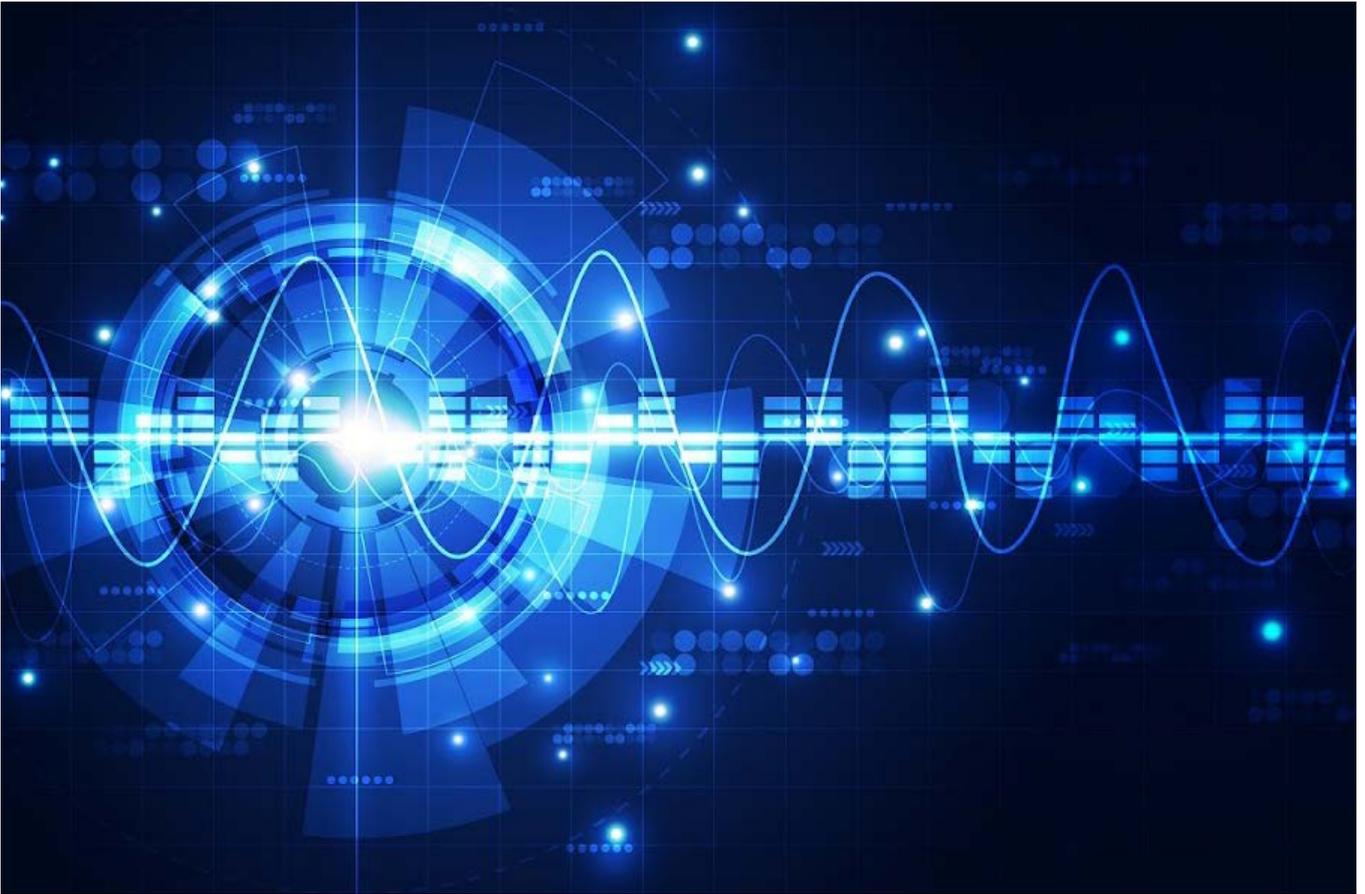
A review of a proposal to replace the administrative licensing regime for shared spectrum uses would encounter technical, legal and economic flaws. Such a proposition would likely be subject to review under the Competition Act 2002, and also lead to legal hurdles for applying auctions to shared-spectrum use.

One of the economic flaws that would arise from the fact that spectrum auctions are a mechanism to assign spectrum rights on exclusive basis to a limited number of users to resolve excess demand. The government would have to justify the economic benefits of closing its space economy or reducing it to a minimum participation. In addition, significant costs would be imposed on India from the loss of the shared satellite capacity that India requires in present and future terms; those costs would hugely surpass any fees collected through an auction.

Satellite based communication is very different from terrestrial communications, both are distinct technologies and governed by separate rules and regulations. A forward-looking approach by policymakers is needed to adopt the best practices based on technology and market dynamics in line with international best practices.

The international trend is clear, and it is against auctions. Out of the 193 ITU member countries, very few including the US, Mexico and Brazil, have ever attempted to auction satellite spectrum in the past. All such experiments have been abandoned and the practice of auctioning satellite spectrum has been replaced with a globally adopted administrative process.

The need of the hour is an Open Sky Policy wherein the Satellite operators having capacity over India are permitted to provide full spectrum bandwidth to the Indian users in a competitive manner so that satellite capacity pricing is made available at an affordable level to all.



## Why is Satellite Spectrum not auctioned internationally?

Globally, satellite operators do not request exclusive tenure of spectrum rights to deliver services and are not requesting exclusive spectrum rights in India either. Because satellite spectrum-orbital resources are a globally shared public good managed by the ITU, satellite operators' business models and service designs are different from terrestrial services. Instead, shared spectrum use is naturally suited for administrative licensing (the global practice).

Auctions have been used to manage excess-demand in the terrestrial wireless context for decades, particularly for the mobile industry. Although, the practice is well established, to date there is no consensus amongst mobile operators and their associations on the approach that governments should take to ensure a fair value for their exclusive spectrum use. Through auctions, mobile operators buy the rights for exclusivity of spectrum use for 20 or even 30 years, and by doing so, they exclude new entrants and new options for consumers. What price should they pay for such luxury? No single answer has been offered.

When engaging in spectrum auctions, mobile operators are naturally driven to seek the lowest cost possible in ensuring reduced competition and minimum risk of new entrants for 20 to 30 years. Many mobile operators' request lowering of base prices at auctions; this follows a carefully calculated bidder behaviour that strives to reduce costs, maximise revenue and eliminate competition as much as possible. Such calculating bidder behaviour may not necessarily be aligned with governments' public policy goals.

**To replace the administrative licensing regime for shared spectrum uses which is an international practice for satellite services would encounter technical, legal and economic flaws.**

There would be several legal hurdles for applying auctions to shared-spectrum use. The idea of auctioning shared goods is hard to grasp on its own, let alone devise a rational policy to implement it. First, such proposition would likely be subject to review under the Competition Act 2002. A review of a proposal to replace the administrative licensing regime for shared spectrum uses (an international practice that includes satellite services) would encounter technical and economic flaws.

One of the technical flaws, amongst other considerations, would be the issue that hundreds of satellite systems are visible from the geostationary arc (GSO); and NGSO satellite systems would add hundreds more. All these systems belong to different administrations and all reuse and share the same spectrum. One of the economic flaws that would arise from the fact that spectrum auctions are a mechanism to assign spectrum rights on exclusive basis to a limited number of users to resolve excess demand. The government would have to justify the economic benefits of closing its space economy or reducing it to a minimum participation.



In addition, significant costs would be imposed on India from the loss of the shared satellite capacity that India requires in present and future terms, and those costs would greatly surpass, any fees collected through an auction.

Therefore, it is unclear what problem a change in the administrative licensing regime would attempt to address. What are the additional complexities and costs from phasing-out administrative licensing of the shared spectrum resources? What are the costs to the Government and the wider economy?

The use of the “same service, same rules” narrative is a tool to buy the rights to close down new market actors. Expanding exclusive spectrum rights by encroaching into shared spectrum bands does not guarantee a better market structure. In fact, this results in the exact opposite. CCI has debunked the argument of “same service, same rules” and legal precedent exists that not all communication services in India are considered “same services”. Space-based communication is very different from terrestrial communications, and hence, their business models are very different too.

The Competition Commission of India (CCI) correctly states that “spectrum ownership creates a competitive advantage for operators providing wireless access services”. Hence, CCI links exclusive spectrum ownership to market competition. Satellite operators are not, and will not, request the government to sell exclusive spectrum rights to them. Spectrum ownership, as a practice, concerns the exclusive tenure (spectrum rights) of spectrum by mobile operators within the jurisdiction of India. Contrary to the exclusive spectrum rights that are enjoyed by terrestrial cellular operators for decades, space-based communications reuse the same spectrum over and over again to service multiple countries from the same satellites (i.e., dozens of satellite operators can use the same spectrum on a non-exclusive basis with international ITU coordination and spectrum reuse requirements) from both the GEO arc and from non-GEO systems.

In conclusion, space-based communications use and reuse shared spectrum resources. Auction mechanisms for shared spectrum use would be impractical, hence such an approach has not become international practice. Such an approach would likely create unnecessary difficulties, both in technical and legal terms. It would also cast a shadow of doubt on the ability of the government to differentiate between the calculating bidding behaviour of the proponents of such an approach and real policy analysis: what is the problem that is being addressed by such an approach and why?

**Satellite based communication is very different from terrestrial communications, both are distinct technologies and governed by separate rules and regulations. A forward-looking approach by policymakers is needed to adopt the best practices based on technology and market dynamics in line with international best practices.**



## Satellite Spectrum Licensing Regime – International Learnings

The discourse on identification and allocation of spectrum to IMT and Satellites, often touches upon the method of allocation. Some of the discussions hint at a method of Spectrum allocation for satellite operations to be via auction, as is the case of IMT Spectrum and a few examples are cited as international reference.

On the contrary, a deep dive into this issue with the referenced nations presents a totally different picture. The few countries that have attempted to auction the NATIONAL orbital resources, to which, of course, some spectrum will be associated, have failed and abandoned the practice of auctioning satellite spectrum and replaced it with an administrative allocation process. And this is for a good reason.

The reason for this is that exclusive terrestrial mobile services spectrum has to be managed only by a single mobile operator in a given geographic area and,

therefore, cannot be shared amongst the operators, while in the case of satellites, the same spectrum is non-exclusive in nature as it can be used by multiple satellite operators to serve the same geographic area. In other words, assignment by auction for satellite spectrum, that can otherwise be shared between operators, such as the C/Ku/Ka bands, would lead to unnecessary segmentation and a very inefficient use of spectrum. For this reason, there are no precedents of spectrum assignment by auction to satellite services in these bands in any country.

**The few countries that have attempted to auction the NATIONAL orbital resources have failed and abandoned the practice of auctioning satellite spectrum and replaced it with an administrative allocation process.**

These statements on the auction of frequency slots for Satellite spectrum usage are explained on the basis of auction process that was experimented in some of the countries. What is masked in this explanation is that the auction being experimented is for the Orbital slots on geostationary arc along with the associated frequency spectrum. Even the very few examples of auctions for domestic filing/GSO orbital slots have revealed to be mostly unsuccessful.

The auctions mentioned in Mexico, Thailand and Brazil are not for “satellite spectrum”, but for domestic filing/GSO orbital slots. However, other satellite operators are still allowed, pending the relevant license/authorization and satellite network coordination, to use the spectrum, as the spectrum, as such, is not being auctioned.

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Contrary to claims, administrative allocation of satellite spectrum is the norm around the world and not a “relic”. Out of the 193 ITU member countries, very few including the US, Mexico and Brazil etc., have ever attempted to auction satellite spectrum in the past. Brazil in 2020 amended its regulatory framework to replace satellite auctions with administrative licensing. Since 2004, the U.S. has replaced its auction rules with a streamlined administrative process for all satellite spectrum. Mexico is the only country with a satellite auction process still in its regulations, but the last time it attempted to conduct such an auction was in 2014 resulting in a failure. Virtually all such experiments in the world have been abandoned and the practice of auctioning satellite spectrum has been replaced back with a globally adopted administrative process.

Brazil abandoned satellite auctions completely in 2020 and replaced satellite auctions vide Law No. 9,472 of July 16, 1997, with administrative process that can be referred at § 172, as amended by Law No. 13,879 of October 3, 2019. The consultation of this amendment specifically mentions that “It is also important to highlight that an international benchmark study was carried out, seeking to assess how other administrations deal with the matter. Of the countries analyzed (8 in total), only Mexico adopts a bidding procedure for conferring rights, similar to the Brazilian case. Therefore, there is a mismatch between Brazilian procedures and those adopted by several countries with relevant satellite markets.”

Thailand tried to auction orbital slots in 2021 for the first time, but it was cancelled (only one bidder). Instead, Thailand will be assigning the slots administratively. Being a recent developments, the details are available from multiple news sources across the internet.

As established, international experience shows that auctions has only ever been attempted in a small number of countries and only for domestic satellite orbitals slots, and that nearly all of those countries have abandoned the practice. Furthermore, even the very few examples of auctions for domestic filing/GSO orbital slots have been unsuccessful. Details for these countries are provided in the following table:

**Table Showing Countries with failed attempt at Satellite Spectrum  
[domestic filing/GSO orbital slots] Auctions**

COUNTRIES	SPECTRUM ALLOCATION ATTEMPTS
<b>United States</b>	The United States last conducted a satellite auction in 2004 for three domestic orbital slots for broadcasting services. <sup>1</sup> Since then, it has abandoned satellite auctions completely for legal and policy reasons. Both domestic and foreign satellites are authorized administratively. <sup>2</sup>
<b>Brazil</b>	Brazil abandoned satellite auctions for Brazilian orbital slots in 2020 <sup>3</sup> , noting its inefficiency and the fact that virtually no country in the world uses this method for assigning satellite spectrum. <sup>4</sup> Authorizations to use satellite capacity/spectrum can now be applied and obtained administratively both for Brazilian and foreign satellites. <sup>5</sup>
<b>Thailand</b>	Thailand attempted to auction Thai orbital slots in 2021 for the first time, but it was cancelled twice <sup>6</sup> . The Government is now considering allocating the Thai orbital slots directly to National Telecom. <sup>7</sup>
<b>Mexico</b>	Mexico is one of the few countries that still has a requirement to auction domestic satellite slots. <sup>8</sup> However, the last time Mexico did an auction for orbital slots allotted to Mexico was in 2014 and it failed. <sup>9</sup> Moreover, in relation to foreign satellites, service providers can apply for administratively for authorization to provide service in Mexico. <sup>10</sup>  The list of authorized providers in the various frequency bands and for the various satellite systems is available online.

1 See <https://www.fcc.gov/auction/52>

2 See 47 U.S. Code of Federal Regulations, Part 25

3 See Brazil, Law No. 9,472 of July 16, 1997, § 172, as amended by Law No. 13,879 of October 3, 2019 (in Portuguese) (replacing satellite auctions with administrative process), at <https://informacoes.anatel.gov.br/legislacao/leis/2-lei-9472#livroIIituloVcapIII>

4 See, e.g., ANATEL, Analysis No. 241/2020/MM, Public Consultation regarding the General Satellite Regulation - Item No. 37 of the Regulatory Agenda for the 2019-2020 biennium (17 Dec. 2020) (in Portuguese), at ¶¶ 4.70-4.81, available at [https://sei.anatel.gov.br/sei/modulos/pesquisa/md\\_pesq\\_documento\\_consulta\\_externa.php?eEP-wqklskrd8hSik5Z3rN4EVg9uLJqrLYJw\\_9lNcO6WoeHMBfhEpsGdV8m3dD4wT0pjDpc-gcaIS61R3UjJd\\_ZLkrutrh6DuXQLXjN9HUfMz9RrUBhEKskb\\_KXbDORK](https://sei.anatel.gov.br/sei/modulos/pesquisa/md_pesq_documento_consulta_externa.php?eEP-wqklskrd8hSik5Z3rN4EVg9uLJqrLYJw_9lNcO6WoeHMBfhEpsGdV8m3dD4wT0pjDpc-gcaIS61R3UjJd_ZLkrutrh6DuXQLXjN9HUfMz9RrUBhEKskb_KXbDORK)

5 Title II, Chapter I, Article 16 of Resolution 748/2021 (General Regulation of Satellite Exp

Art. 16. In order to obtain, amend or extend the Brazilian or Foreign Satellite Exploitation Rights, the Satellite Operator or its legal representative, in the case of Foreign Satellite, must formalize a request before the Agency, through its own electronic form, contained in the Agency's computerized system, and meet the following general conditions:

I - be a legal entity, under public or private law, incorporated under Brazilian law and with headquarters and administration in the country.

II - not being prohibited from bidding or contracting with the Government, not having been declared disreputable or having not been punished, in the previous 2 (two) years, with the decree of expiry of a concession, permission or authorization of telecommunications service, or of expiry of the right to use radio frequencies or Satellite Exploration.

III - have legal and technical qualifications for satellite exploration, economic and financial capacity and fiscal regularity with the Federal Treasury and be in good standing with the Guarantee Fund for Length of Service (FGTS);

IV - present a simplified technical design of the satellite communication system, keeping it up to date; and

V - submit a statement of compliance with the applicable regulations and of awareness of the grant conditions.

6 <https://www.bangkokpost.com/business/2167347/auction-for-satellite-orbital-slot-cancelled-again>  
<https://www.bangkokpost.com/business/2207283/satellite-bid-in-limbo>

7 <https://www.bangkokpost.com/business/2249691/talks-aim-for-solution-to-stalled-orbital-slots>

8 See Reglamento de Comunicación Vía Satélite, Art. 4, available at <http://www.ift.org.mx/transparencia/marco-normativo/reglamentos>

9 <https://www.elfinanciero.com.mx/empresas/ift-declara-desierto-proceso-de-licitacion-de-posiciones-orbitales/>

10 <https://rpc.ift.org.mx/vrpc/>

The only other example cited is the case of Saudi Arabia,<sup>11</sup> which recently announced that it intended to auction domestic MSS spectrum in the 2GHz band. This is different, as MSS spectrum in the 2GHz band, similarly to spectrum allocated to mobile terrestrial operators, is not so easily shared amongst satellite operators in the same location. Even then, countries such as the United States have found ways to assign this spectrum by administrative process rather than auction.<sup>12</sup>

The international trend is clear, and it is against auctions. Very few countries have ever thought that auctions are an appropriate method even for assigning domestic satellite slots. The few who have, have either abandoned the practice (e.g. US, Brazil) or discovered the difficulties of such auctions (e.g. Thailand, Mexico).

In line with international best practices, auctioning of the Satellite spectrum may not be a feasible and desirable solution in the Indian context as well. An auction for satellite spectrum would artificially limit the number of satellite operators sharing the spectrum and exclude them from the market, as different from terrestrial mobile operators, multiple satellite operators can reuse the same frequency range. The need of the hour is an Open Sky Policy wherein the Satellite operators having capacity over India are permitted to provide full spectrum bandwidth to the Indian public in a competitive manner so that satellite capacity pricing is made available at an affordable level to all.

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11 [https://www.citc.gov.sa/ar/new/publicConsultation/Documents/PublicConsultationon\\_EN\\_144303.pdf](https://www.citc.gov.sa/ar/new/publicConsultation/Documents/PublicConsultationon_EN_144303.pdf)

12 See FCC, *Establishment of Policies and Services Rules for the Mobile Satellite Service in the 2 GHz Band*, FCC 00-302, Report and Order (25 Aug. 2000)

## SUPPORTING ORGANISATIONS



## SUPPORTING ASSOCIATIONS



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For more information, please contact

**SATCOM INDUSTRY ASSOCIATION**

Suite B-306, 3rd Floor, Somdatt Chambers-I 5, Bhikaji Cama Place, New Delhi-110066

Tel: +91-11-4604 8743 • Email: [info@sia-india.com](mailto:info@sia-india.com)

**[www.sia-india.com](http://www.sia-india.com)**