Letter No : NXT/TRAI/CP/20230601
Date : 1st June 2023

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Mahanagar Door Sanchar Bhawan,
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Respected Sir,

Subject : Response to the TRAI's Consultation Paper on "Assignment of Spectrum for Space-based Communication Services"

We would like to thank the Authority for providing us the opportunity to furnish our Comments & Counter Comments on **TRAI's Consultation Paper on "Assignment of Spectrum for Space-based Communication Services "**dated 06th April 2023.

In this regard, we hereby enclose our comments as Annexure-I.

Please do let us know in case of any further information that may be required from our side.

Thanking You
Yours Sincerely
NXTDIGITAL – A division of Hinduja Global Solutions Limited

Vynsley Fernandes
Whole Time Director

Annexure-I

NXTDIGITAL (NXTDIGITAL) comments on TRAI CP on "Assignment of Spectrum for Space-based Communication Services"

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.

NXTDIGITAL Response:

For gateway links and user links in this scenario, the availability of protected and sufficient spectrum for the space sector is essential in order to enable spaced-based communications using LEO, MEO, and GEO constellations with the spectrum utilization covering over C, Ku, Ka, and Q/V bands.

Players in the satellite industry rely on the long-term availability of the current ITU primary or co-primary satellite spectrum in the C, Ku, Ka, and future Q/V bands to support the ongoing development of new cutting-edge satellite systems that can provide an advanced MSS (mobile satellite services), FSS (fixed satellite services), and BSS (broadcast satellite services).

The C and Ku-bands are the most extensively used for commercial FSS services, while the Ka-band is seeing rapid uptake and hefty new investments because technological advances have helped the industry to unleash the full potential of available large bandwidths for high-capacity systems. It is anticipated that utilization of these important bands will continue to increase, with the Ka spectrum seeing the fastest rise. Every satellite band can support video and data applications due to the digitization of all modern communications, but a recent trend is the deployment of High Throughput Satellites in geostationary and non-geostationary orbits to meet the expanding global demand for broadband data.

To secure and maintain the satellite industry's unrestricted expansion, all of the frequency spectrum bands designated by ITU-R and supported by NFAP are required.

In order for the satellite operators to fully benefit from the newest software-defined satellite payloads that suits numerous needs users, these bands should not be divided into spectrum for gateway links vs user links.

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:

NXTDIGITAL Response:

The spectrum available for satellite communications is limited in comparison to IMT (International Mobile Telecommunications) bands, further some of the limited satellite based communication frequency bands have already been repurposed for IMT. Now, with the growing demand for satellite communications, it is important for TRAI to fully harmonize India's spectrum usage referencing global practice's.

It is important to note that the spectrum allocated for satellite services can be used interchangeably for gateway and user links, subject to applicable restrictions in the ITU Radio Regulations or the Indian National Frequency Allocation Table. For example, the C-band in geostationary satellites can be used for both gateways and user beams. In some High Throughput Satellite designs, portions of the C-band may be used as gateway spectrum to support Ku-band spot beams, or the Ka-band may be used as gateway spectrum for Ku-band spot beams. The newest satellite designs have software-defined payloads that can create beams as required and deploy any frequency into such beams for gateway or user links. A number of satellite operators have also announced next-generation satellites using Q-/V-band frequencies for gateways and user links. Indeed, ISRO itself has launched a demonstration Q-/V-band payload on GSAT-29.

Further, as C- band in India has already seen a lot of stress as part of the C band in India from 3.4 to 3.67GHz has already been allocated to 5G. As C-band is one of the most reliable band's for FSS and BSS, therefore it is recommended that there should not be any further changes of the same-

Present Demand –

Type of service	Name of the satellite system	Type of satellite (GSO/ LEO/ MEO)	Frequency range and quantum of spectrum required.							
			User Link (Earth to space UL)		User Link (Space to Earth DL)		Gateway Link (Earth to space UL)		Gateway Link (Space to Earth DL)	
			Frequency range	Quantum (in MHz)	Frequency range (in MHz)	Quantum (in MHz)	Frequency range (in MHz)	Quantum (in MHz	Frequency range (in MHz)	Quantum (in MHz
Access										
Internet										
NLD										
ILD										
GMPCS										
VSAT CUG (Commercial)										
Captive VSAT CUG										

Type of service	Name of the satellite system	Type of satellite (GSO/ LEO/ MEO)	Frequency range and quantum of spectrum required.							
			User Link (Earth to space UL)		User Link (Space to Earth DL)		Gateway Link (Earth to space UL)		Gateway Link (Space to Earth DL)	
			Frequency range	Quantum (in MHz)	Frequency range (in MHz)	Quantum (in MHz)	Frequency range (in MHz)	Quantum (in MHz	Frequency range (in MHz)	Quantum (in MHz
Machine to Machine (M2M)										
DTH										
Teleport										
DSNG										
HITS	IS 39	GEO			3707–3743 LV	36	5932–5968 LH	36	3707–3743 LV	36
					3707–3743 LH	36	5932–5968 LV	36	3707–3743 LH	36
					3747–3783 LV	36	5932–6008 LH	36	3747–3783 LV	36
					3747–3783 LH	36	5972–6008 LV	36	3747–3783 LH	36
					3907-3943 LV	36	6132–6168 LH	36	3907-3943 LV	36
					3907–3943 LH	36	6132–6168 LV	36	3907–3943 LH	36
IFMC										
Any other relevant service (please specify)										

Likely demand after about five years

Type of service	Name of the satellite system	Type of satellite (GSO/ LEO/ MEO)	Frequency range and quantum of spectrum required							
			User Link (Earth to space UL)		User Link (Space to Earth DL)		Gateway Link (Earth to space UL)		Gateway Link (Space to Earth DL)	
			Frequency range	Quantum (in MHz)	Frequency range	Quantum (in MHz)	Frequency range	Quantum (in MHz	Frequency range	Quantum (in MHz
Access										
Internet										
NLD										
ILD										
GMPCS										
VSAT CUG (Commercial)										
Captive VSAT CUG										
Machine to Machine (M2M)										
DTH										
Teleport										
DSNG										
HITS	**FULL C-band and Ku-band**									
IFMC										
Any other relevant service (please specify)										

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.

NXTDIGITAL Response:

To eradicate possibility of any potential interference to signals of a GSO based satellite by any LEO or MEO satellite, there should be a limit on the number of NGSO satellites or the frequency band of operations for NGSO and GSO satellite should be segregated.

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 assignments? If yes, in what manner can the challenges be overcome? Kindly elaborate the challenges and the ways to overcome them.

NXTDIGITAL Response:

For satellite communication services, the same set of frequencies are reused for communication on different satellites placed at different orbital positions in the geosynchronous orbit (GSO) and therefore, allocation of one set of frequencies for one satellite does not restrict the repeat allocation of same set of frequencies to another satellite positioned after a certain coordinated minimum angular orbital.

The exclusive allotment of any frequency spectrum in satellite communications frequency bands like the C-band, Ku-band, Ka-band and Q/V should be avoided. In contrast to the terrestrial mobile network where the same frequencies can be reused in multiple distant cells, for a satellite-based distribution platform the service provider uses a set of frequencies for pan-India coverage only on one satellite but if the same service provider reuses the same frequency on other satellite for same coverage would be non-prospective. This shows that exclusive satellite spectrum allocation to any one satellite service provider will cause wastage of satellite resources. Therefore, exclusivity in allotment of satellite spectrum is not recommended.

Multiple satellite operators can reutilize same frequencies on different satellites without interfering with one another.

Under the well-established priority and coordination structure of the ITU Radio Regulations, there are already multiple satellite systems - in GSO and NGSO - that successfully use the same frequency bands today with coverage of and the ability to serve India.

We recommended that India adopt a fair and transparent system for administrative assignment of satellite spectrum consistent with the ITU framework.

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.

NXTDIGITAL Response:

Terrestrial mobile communications are not developed, planned or deployed in the same manner as space-based communications. The characteristics of frequency carriers, equipment design and mobile network planning are being aligned with spectrum use by space services. 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 (Third Generation Partnership Project). Satellite spectrum availability has direct proportionality with the number of users that 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 (World Radiocommunication Conferences). Therefore if the intent is to auction satellite spectrum band, there will be no choice but to divide it into portions or blocks (like done for terrestrial).

Necessarily therefore, this would result in the fragmentation of satellite spectrum which in turn will decrease throughput and data speeds in proportion to the fragmentation. In effect, this means a great reduction in the efficiency of spectrum usage which goes against the most basic objective of any spectrum policy. The logistics and coordination required in managing this, would be extremely challenging for the India administration.

Further to the above, C- band, where part of this spectrum (3300 – 3670 MHz) has already been auctioned and allocated to IMT 5G services in India, has already seen a lot of stress. The Telecom Regulatory Authority of India ("TRAI") had recommended use of 3300 – 3670 MHz frequency spectrum for 5G services and the balance C-Band spectrum i.e. 3700 – 4200 MHz for use by the broadcasters, HITS and other C-band services providers.

To mitigate the interference in the 3700 – 4200 MHz spectrum due to 5G IMT signals operating in 3300 – 3670 MHz frequency spectrum, TRAI had recommend using high quality 5G Rejection Band Pass filters in the reception of C-Band downlink to avoid 5G interference. Based on TRAI's recommendations and the Honorable MIB's advice, recommended filters have been installed but post installation of these filters also we continue to face disturbance in our signal due to which we at NXTDIGITAL who operate India's only HITS (Headend in the Sky) platform had to drop down our operational Mod-Cod from 32APSK-5/6 to 16APSK-5/6. This has resulted in huge inefficiencies of approximately 125 Mbps lesser bandwidth being available for our services due to which we had to drop almost 100 channels/services from our HITS line-up. To accommodate the same i.e. adjust the current services that were dropped, we have had to onboard an additional 6th Transponder at a very high cost.

Since August 2021, we, along with other stakeholders, have continuously informed our concerns to various levels of concerned Ministries, Authorities and Regulators on the interference issues that arises due to the 5G IMT services in C-Band and had stressed with the MIB that the additional expenses, due to 5G rejection filters implementation, were being unfairly being thrust onto our business and the businesses of our thousands of small cable operator partners, which have already witnessed severe impacts due to Covid over the last few years and for which there is an ongoing struggle to find solutions.

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

NXTDIGITAL Response:

India should encourage a framework for intra-band sharing among satellite service providers based on the well-understood ITU priority and coordination framework which is a well understood international framework for sharing between NGSO and GSO systems (e.g. in the form of Equivalent Power Flux Density limits at the geostationary arc and as between NGSO systems, based on the date priority and the sharing techniques discussed in response to Q3 above. Some country such as U.K. and other countries in Europe, adopt the ITU framework for domestic use, while others, such as the U.S., use a transparent first-come-first-served system for slots that are not already licensed.

It should be noted that the fact that an intra-service sharing framework already exists at the ITU level and which 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 no longer be exclusive, and it becomes difficult to see the point of conducting an auction.

The existing ITU Intra-services sharing framework could be easily adapted for India, which clearly defines no need to assign exclusive satellite spectrum. Additionally, by adopting well-understood intra-service sharing rules, the assignment of satellite spectrum will no longer be exclusive, 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.

NXTDIGITAL Response:

The International Telecommunication Union (ITU) has established a framework for coordinating the use of satellite frequencies among multiple satellite systems. This framework serves as a strong foundation for facilitating shared use of satellite spectrum in India.

The ITU framework includes several key elements, such as the use of Equivalent Power Flux Density in proportion with the directional gain of coordinated GSO and NGSO satellites for given receiving earth stations, limits to safeguard Geostationary Earth Orbit (GSO) systems against Non-Geostationary Orbit (NGSO) systems in most frequency bands, as outlined in Article 22 of the ITU Radio Regulations. The framework requires that earlier filed satellite networks are protected from harmful interference unless coordination has been completed.

While the ITU framework is regularly updated and refined, it is essential for India to ensure that its satellite sharing regulations are informed by the latest international standards and best practices. By incorporating these developments into its policies, India can effectively

promote the shared use of satellite spectrum, thereby enabling greater access to these critical resources for a wider range of stakeholders.

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

NXTDIGITAL Response:

The Telecom Regulatory Authority of India (TRAI) has been consulting on the use of exclusive spectrum assignment for satellite systems in India.

One issue is that if India were to adopt exclusive assignment, the spectrum assignment mechanism for satellite systems would create significant uncertainties that would impact investment in space communications. Operators and countries would have to coordinate their spectrum-orbit resource use through the globally established and shared spectrum regime under ITU standards and obligations thereby, and additionally with a newly created regime of private-exclusive users only adopted by India.

Frequencies and orbits are being managed together through the ITU process, and their legitimate use is derived from their successful recording in the MIFR “Master International Frequency Register”.

Any new system must ensure continuity of existing services. Whereas the existing users of C-band, Ku-band, and Ka-band spectrum in India, including ISRO's satellites and foreign satellites that have been made part of the INSAT system, would be highly disrupted by the introduction of a new system of exclusive satellite spectrum assignment.

However, introducing a system of sharing spectrum with existing users would naturally raise questions about why exclusive assignment is necessary at all and why the sharing rules could not accommodate future entry.

Moreover, exclusive frequency licensees coordinating amongst themselves and/or having these licensees come up with their own coordination regime would likely result in challenging dispute and grievances resolution processes. Having two parallel regimes in India, one dealing with private-exclusive users and another for public-shared users, is unlikely to simplify the already complex frequency coordination process for space radiocommunications, as well as being unlikely to provide investment certainty.

The consultation paper cites examples of auctions in other jurisdictions. However, these examples validate the industry view that auctions are not feasible for satellite spectrum. Only four countries (Brazil, Mexico, USA and Saudi Arabia) have engaged in some form of competitive allocation in connection to space communications, three of those countries (Brazil, Mexico and USA) decided to discontinue the auction system for satellite communications as it was not practicable.

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.

HGCL Response: For Q 6 (a) to (c) our response is the same as that of Q5

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.

NXTDIGITAL Response: Our response is the same as that of Q5

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.

NXTDIGITAL Response: Our response is the same as that of Q5

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 a broad framework should be prescribed, kindly suggest the framework and elements to be included in such a framework.

NXTDIGITAL response:

We advocate that the frequency spectrum in satellite communication frequency bands such as C band, Ku band and Ka band for space- based communication services should be assigned on shared (non- exclusive) basis due to inherent nature of satellite services and thereby to provide a more level playing field for satellite operators using these bands to deliver the same service to the same users.

Also, the spectrum assignment process for satellite-based communication services should not be equated in the context of terrestrial services. On the contrary, it should be noted that satellite industry uses different frequency ranges for uplink and downlink in a paired manner and therefore the licensing structures for these services should be more consistent to ensure faster deployment and better service.

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

Kindly justify your response.

NXTDIGITAL Response: India should adopt a Regulatory regime that is in line with the Standardized ITU framework to motivate interested Satellite players for competition and innovations as taking place in the global satellite industry.

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.

NXTDIGITAL Response:

To ensure that India can benefit from both satellite broadband services and terrestrial IMT/5G, it is important for TRAI and DOT to allocate frequency bands in a way that balances the needs of both the services. The 28 GHz band should be exclusively allocated for satellite services to maintain compatibility, while other globally harmonized frequency bands (such as 24.25-27.5 GHz, 37-43.5 GHz, 45.5-47 GHz, 47.2-48.2, and 66-71 GHz) can be identified for terrestrial IMT/5G.

It is important to note that any plan that partially identifies the 28 GHz band for IMT, restricts its use by satellite services, or sharing it with IMT would not achieve a balanced spectrum supply for space-based communications. IMT already has access to the full 26 GHz band, which is still not being fully utilized, and there are other existing and potential IMT bands under discussion at WRC-23.

Using Ka band spectrum, in part or in full, for terrestrial IMT would also be inconsistent with a spectrum policy that prioritizes meeting the growing demand for space-based communication services. The Ka band is widely used for Ultra High Throughput Satellite

systems, particularly for ubiquitous FSS and ESIM, and over 100 countries have adopted or plan to use this band. It is crucial to maintain a globally shared spectrum regime managed by the ITU and harmonized with the International Radio Regulations to ensure efficient use of spectrum resources.

Many countries in the Asia Pacific region, such as China, the Philippines, Australia, and Thailand, have allocated the full 28 GHz band exclusively for satellite connectivity to deploy FSS and ESIM (Earth-station in Motion) for aviation, maritime, and land uses. Thailand, for instance, recognizes the growing need for high-capacity broadband in mobility and has allocated the full 26 GHz band which is still not being fully ustilised and there are other existing and potential IMT bands under discussion at WRC-23.

The Ka band has become the preferred choice for Ultra High Throughput Satellite systems, especially for Fixed Satellite Services (FSS) and Earth Station in Motion (ESIM), and over 100 countries, including China, Australia, and Thailand, have adopted or plan to use it. A contiguous and stable spectrum access is necessary for the satellite industry to offer advanced technologies to consumers, and the Ka band provides the necessary capacity for efficient, cost-effective broadband connectivity that is unavailable in other bands. However, the frequency range 27.5-28.5 GHz is identified for International Mobile Telecommunications (IMT) in India, which could further limit the availability of this band.

India has plenty of spectrum and options available for mobile services, with more than a dozen telecom reforms in September 2021 and reductions in the prime 700 MHz band and current mm-Wave price band. The government has declared auctions as an annual affair to meet any shortage of spectrum for the mobile industry, and mobile operators have carrier aggregation, reframing of legacy bands, and Integrated Access Backhaul (IAB) options.

India already has more than 3250 MHz of spectrum bandwidth in the 26 GHz spectrum band for mobile operators most of which lies unused, and assigning the 28 GHz band to IMT, which was not identified at WRC-19, will further add to inefficient allocation/usage of spectrum. Also, 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 high capital requirements for deployments in such bands.

Therefore, it is recommended that 27.5 to 28.5 GHz band must be protected and made part of the complete allocation from 27.5 GHz to 31.5 Ghz and reserved for new satellite based technologies which can offer full capacities and coverage to unserved and under-served areas.

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.

NXTDIGITAL Response:

As previously mentioned above, IMT systems operating on TDD “Time division duplexing” frequency bands are not intended to be interoperable with Fixed Satellite Service (FSS)

in Geostationary Orbit (GSO) or Non-Geostationary Orbit (NGSO), as well as Earth Stations in Motion (ESIM), which was affirmed by ITU Resolution 212 during WRC-15.

In order for India to avail full 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.

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.

NXTDIGITAL Response:

The Ka-band spectrum, particularly the 27.5-31.5 GHz band, is crucial for satellite earth stations, including VSATs, ESIMs, and satellite gateways. It is also vital for the development of innovative HTS and VHTS systems that offer stable connectivity in remote and rural areas. In India, satellite deployments in the Ka-band can provide significant economic benefits, such as broadband connectivity for unserved and under-served areas, improved broadband service quality, wider choice of broadband and pricing options, and new applications and connectivity services.

TRAI's previous recommendations propose to identify 400 MHz for CNPN “Captive non-public network”, which can coexist with satellite earth stations would result in splitting the critical satellite Ka-band 27.5-31.5 GHz, would have a detrimental impact on the capacity and flexibility to serve, and limit choices for innovative companies, resulting in sub-optimal usage of the spectrum resource.

Allowing “flexible use” with CNPN in this band would impair even more the throughput and overall capabilities of these innovative satellite systems to provide services in India.

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.

NXTDIGITAL Response:

The compatibility between IMT systems (TDD) and FSS GSO/NGSO, ubiquitous FSS and ESIM is a concern due to the difference in their design. As per ITU Resolution 212, WRC-15, IMT can only be allowed as secondary use, on a non-interference/ non-protection basis.

The challenges associated with sharing between CNPN, and space-based communications would be the same as those for co-existence with IMT in the 27.5-28.5 GHz band.

While interference in receiving satellites is expected to be less of a problem than for IMT deployment due to limited deployment, the frequency bands included in this band are where non-geostationary satellite systems have their main focus. This implies that larger and more dynamic deployment of transmitting Earth stations, possibly in a ubiquitous manner, may be expected. Hence, licensing conditions and CNPN system design should take this into account to avoid hindering the development of space-based communications.

Moreover, the Mobile network operators can meet 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 essentially the same as those between IMT and satellite communications.

Therefore, it is recommended that the entire 27.5-31.5 GHz band should be reserved for satellite services.

Q14. Whether space-based communication services should be categorized into different classes of services requiring different treatment for spectrum assignment? If yes, what should be the classification of services and which type of services should fall under each class of service? Kindly justify your response. 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:

NXTDIGITAL Response:

There should be an efficient usage of satellite spectrum based on type of application without any categorization of spectrum.

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:

NXTDIGITAL Response: No Comments

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:

NXTDIGITAL Response: No Comments

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.

NXTDIGITAL Response: Administrative

Efficient and competitive utilization of spectrum for user links in L-band and S-band is essential for space-based communication services. This can be done by establishing a regulatory framework that sets administrative rules for the operation of space-based communication services and establishes licensing conditions.

To ensure an orderly and technically compatible use of spectrum, national legislation should be put in place. This legislation will provide the necessary guidelines for the allocation and utilization of spectrum in a manner that promotes fair competition and efficient use. The key to achieving efficient and competitive utilization of spectrum for space-based communication services in L-band and S-band is through the establishment of a regulatory framework that ensures orderly and technically compatible use of spectrum and establishes licensing conditions.

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.

NXTDIGITAL Response: Administrative

Efficient utilization of the spectrum is crucial for the optimal functioning of satellite networks operating in different frequency bands such as C-, Ku-, and Ka-bands. To achieve this goal, it is important to assign the spectrum in a manner that promotes fair competition among users.

To ensure the orderly and technically compatible use of the spectrum, national legislation should be in place, which provides administrative guidelines for the operation of satellite networks and licensing conditions for users. Such legislation can help ensure that the spectrum is used in an efficient and effective manner, benefiting all stakeholders.

Effective spectrum management through national legislation is essential for the optimal functioning of satellite networks in C, Ku, and Ka-bands. This includes the assignment of

spectrum in a fair and competitive manner and the establishment of licensing conditions that enable efficient use of the available spectrum.

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

NXTDIGITAL Response:

There should not be any segregation of spectrum related to user links and gateway link in space-based communication.

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.

NXTDIGITAL Response:

It is strongly advised against auctioning any kind of space services in C-, Ku- and/or Ka-band.

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.

NXTDIGITAL Response:

There should not be any segregation of spectrum related to user links and gateway link in space-based communication.

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.

NXTDIGITAL Response:

It is highly recommended to avoid conducting auctions for conventional satellite-based spectrums that operate in the S, L, C-, Ku, and Ka bands etc. as such auctions could have negative consequences. There should not be any segregation of spectrum related to user links and gateway link in space-based communication.

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.

NXTDIGITAL Response:

Spectrum assignment should be administrative.

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.

NXTDIGITAL Response:

Our recommendation is against auction of satellite-based spectrum and segregation of satellite-based user links and gateway 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?

NXTDIGITAL Response:

Separation distances or protection zones are not necessary for earth stations that use the same frequency band. In other words, it is not required to maintain a certain distance or create designated zones to prevent interference between such earth stations.

There is no need for protection zones or separation distances between earth stations using the same frequency band. Interference protection from other satellite earth stations using the same frequency bands for GSO and NGSO should be as per the standardized ITU guidelines.

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

NXTDIGITAL Response:

(a) Minimum Net Worth – on pro rata basis depending on the service type

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

(c) Requirement of holding license/ authorization under Unified License prior to taking part in the auction process - We strongly do not recommend an auction process.

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.

NXTDIGITAL Response:

The open non-exclusive licensing process for frequency resources in space-based communication now requires service providers to have a contract with a satellite operator to specify which satellite they will use to provide their services. As these contracts come at a cost, it is unlikely that service providers will obtain licenses without genuine plans to implement their services. Therefore, it appears unnecessary to establish specific roll-out or milestone requirements for space-based communication utilized by service providers.

We recommend no segregation in satellite-based spectrum for user and gateway links, spectrum should be assigned to the licensee as a whole , licensee should be motivated for the most efficient usage of the assigned spectrum.

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.

NXTDIGITAL Response:

Imposing limitations on equity crossholding does not seem logical for licensees of satellite-based services, as they do not need to hold any spectrum since it can be shared among users. This may also prove to be detrimental to the growth of the satellite industry.

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.

NXTDIGITAL Response:

The allocation of a frequency band for multiple services by the ITU Radio Regulations does not guarantee technical compatibility between these services. However, the regulations include provisions and criteria aimed at achieving international compatibility. On a domestic level, each country has the sovereignty to adopt its own provisions and criteria, without any guidance provided by the ITU and the Radio Regulations.

In the case of terrestrial microwave links and space-based communication sharing the same frequency band in C, Ku, or Ka-band, there is a potential for interference between the services.

A clear segregation of frequency is recommended as per the NFAP.

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.

NXTDIGITAL Response:

Polarization should not be a factor in considering spectrum usage, as it is solely used by satellite operators to enhance spectrum efficiency. The decision to utilize both polarization, as well as higher orders of modulation and coding, should be left to the discretion of the satellite operator. Such decisions do not affect spectrum usage or the possibility of spectrum denial for other systems.

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

a. Model #1: Exclusive spectrum assignment b. Model#2: Auction design model based on non-exclusive spectrum assignment to only a limited number of bidders What changes should be made in the above models to mitigate any possible issues, including ways and means to ensure competitive bidding? Response on each model may kindly be made with justification.

NXTDIGITAL Response:

It is recommended to refrain from auctioning spectrum access for satellite links at C, Ku, and/or Ka-band, as doing so would have an adverse impact on India's current telecommunications infrastructure and its ability to progress further.

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

NXTDIGITAL Response:

We maintain a consistent view that the use of auction design models, whether on an exclusive or non-exclusive basis, is harmful to space-based communications and therefore does not support the implementation of the same.

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+ Δ), then what should be

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

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

NXTDIGITAL Response:

We maintain a consistent view that the use of auction design models, whether on an exclusive or non-exclusive basis, is harmful to space-based communications and therefore does not support the implementation of the same.

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.

NXTDIGITAL Response:

We maintain a consistent view that the use of auction design models, whether on an exclusive or non-exclusive basis, is harmful to space-based communications and therefore does not support the implementation of the same.

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?

NXTDIGITAL Response:

We maintain a consistent view that the use of auction design models, whether on an exclusive or non-exclusive basis, is harmful to space-based communications and therefore does not support the implementation of the same.

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?

NXTDIGITAL Response:

We maintain a consistent view that the use of auction design models, whether on an exclusive or non-exclusive basis, is harmful to space-based communications and therefore does not support the implementation of the same.

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

NXTDIGITAL Response:

We recommend no segregation in satellite-based spectrum for user and gateway links, spectrum should be assigned to the licensee as a whole, licensee should be encouraged to implement the most efficient usage of the assigned spectrum.

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?

NXTDIGITAL Response:

We maintain a consistent view that the use of auction design models, whether on an exclusive or non-exclusive basis, is harmful to space-based communications and therefore does not support the implementation of the same.

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

NXTDIGITAL Response: NO Comment

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.

NXTDIGITAL Response:

We recommend no segregation in satellite-based spectrum for user and gateway links, spectrum should be charged and assigned to the licensee as a whole , licensee should be motivated for the most efficient usage of the assigned spectrum.

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.

NXTDIGITAL Response:

No, we recommend no segregation in satellite based spectrum for user and gateway links, spectrum should be charged and assigned to the licensee as a whole , licensee should be motivated for the most efficient usage of the assigned spectrum.

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

NXTDIGITAL Response: NO Comment

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.

NXTDIGITAL Response:

We recommend no segregation in satellite based spectrum for user and gateway links, spectrum should be assigned to the licensee as a whole, licensee should be motivated for the most efficient usage of the assigned spectrum with available technologies.

42. 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.

NXTDIGITAL Response:

We maintain a consistent view that the use of auction design models, whether on an exclusive or non-exclusive basis, is harmful to space-based communications and therefore does not support the implementation of the same.

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.

NXTDIGITAL Response:

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. It would be better and simpler to just 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.

NXTDIGITAL Response:

In line with international best practices, auctioning of the satellite spectrum is definitely not a desirable solution in the Indian context. 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.

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.

NXTDIGITAL Response:

In the field of space-based communications, it is typical to impose an administrative licensing fee on operators who wish to utilize the necessary spectrum. The amount of this fee can vary significantly from one country to another, as it is based on national policy and aims to cover the costs associated with administering licenses and processing licensing applications. International administrative spectrum charges/ fees should serve as a basis for determining India's administrative fees for assigning satellite spectrum, subject to necessary adjustments to take into account cross country differences.

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?

NXTDIGITAL Response: NO Comment

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.

NXTDIGITAL Response: NO Comment

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

NXTDIGITAL Response:

We recommend no segregation in satellite-based spectrum for user and gateway links, spectrum should be assigned to the licensee as a whole , licensee should be motivated for the most efficient usage of the assigned spectrum with available technologies.

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.

NXTDIGITAL Response:

We recommend no segregation in satellite-based spectrum for user and gateway links, spectrum should be assigned to the licensee as a whole , licensee should be motivated for the most efficient usage of the assigned spectrum with available technologies.

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.

NXTDIGITAL Response: NO Comment

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.

NXTDIGITAL Response: NO Comment

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 bands in case of

I. exclusive

ii. shared assignment and why?

Please support your answer with detailed justification.

NXTDIGITAL Response:

We recommend no segregation in satellite-based spectrum for user and gateway links, spectrum should be assigned to the licensee as a whole, licensee should be motivated for the most efficient usage of the assigned spectrum with available technologies.

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.

NXTDIGITAL Response:

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. It would be better and simpler to just 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.

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.

NXTDIGITAL Response:

When it comes to non-exclusive licenses for space-based communications, various payment options are available for administrative filing fees. However, an annual upfront payment is often considered the most practical and widely used approach. This payment option provides license holders with the flexibility to manage their finances and plan for the upcoming year. An annual upfront payment allows the regulatory agency to allocate resources and plan for the future, Therefore, an annual upfront payment for administrative filing fees is a reasonable and efficient approach for non-exclusive licenses for space-based communications.

TRAI should introduce payment schemes for encouraging competition and innovativeness in satellite based services for existing as well as new entrants.

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