



Response to TRAI Consultation Paper on
"Assignment of Spectrum for Space-based Communication Services"

Preface:

1. The Indian Telecom and technology sector stands out globally by providing affordable services to a large population. With a diverse set of service providers contributing to its overall development, this sector shines as one of the brightest in the world.
2. Given the diverse landscape of service providers in the telecom sector, it becomes crucial to grant equal opportunities for accessing limited resources and apply the principle of "Same Service Same Rules" to safeguard the interests of all stakeholders.
3. In order to ensure fair competition and transparency in the sector, India has adopted the auction-based assignment of spectrum for mobile access services. This approach not only guarantees a fair and transparent process for spectrum assignment but also allows the market forces to determine the spectrum price.
4. **It is important to note that wireless access services are no longer confined to terrestrial networks alone. The emergence of Non-Geostationary Orbit satellites has made it possible to provide terrestrial network-like communication access services through satellites.** The satellites can now server the retail consumers directly on their devices like mobile phones. Therefore, with the introduction of these new technologies in satellite-based services, it is now an opportune time to reassess the spectrum assignment process for space communication services.
5. **It is necessary to move away from the administrative assignment of spectrum (for space based communication services), which relies on a "first come, first serve" basis, and implement an auction-based regime for spectrum assignment in space communication sector.** This transition will ensure that spectrum is assigned through a transparent method at market-driven price to ensure fair competition. This approach will uphold the principle of "Same Service Same Rule" for all types of service providers, including terrestrial (wireline and wireless) and satellite (wireless) communication.
6. The auction-based spectrum assignment method provides a clear assignment criteria and eligibility, ensures openness and transparency. In contrast, the administrative assignment regime, which follows the principle of "first come, first serve," fails to meet these fundamental requirements. **Honourable Supreme Court in its Judgement in 2G matter has also prescribed an auction-based assignment** for the spectrum to ensure transparency in the assignment process.
7. Another important aspect of spectrum management and assignment is the need for efficient utilization. To facilitate this, it is **essential to allow service providers the flexibility to use the spectrum for any technology that is relevant and caters to the**



DEN Broadband Limited

CIN: U74140DL2011PLC228312

Regd. Office: 236, Okhla Industrial Estate, Phase-III, New Delhi -110 020

Landline: +91 11 40522100 || Facsimile: +91 11 40522203 || E-mail: denbroadband@denonline.in ||

www.denbroadband.com



prevailing market requirements. Additionally, service providers should have the freedom to share, trade, and lease the spectrum with eligible counterparts holding relevant service licenses. This approach will empower service providers to optimize spectrum usage, considering its limited availability as a valuable resource.

8. In summary, considering the technological developments in the space based communication services, all the **spectrum for space based communication services (except spectrum within C-Band that serves the current teleport/broadcasting Sector), needs to be exclusively assigned through auctioned to maintain transparency and level playing field in the sector.** This will ultimately benefit the consumers of country as they will continue to enjoy access to the services of diverse set of service providers.

ISSUE WISE RESPONSES

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.

Response:-

As stated in the preface of this response, the spectrum for space-based communication services should assigned exclusively through auctions. Rather than adopting a fragmented approach, it is **recommended to auction all available spectrum bands** (except spectrum within C-Band that serves the current teleport/broadcasting operations), attracting a diverse range of service providers to participate in the bidding process.

Furthermore, to accommodate the varying needs of service providers, **the auctioned spectrum should be allowed to be utilized for any technology that effectively addresses the market requirements.** This flexibility will enable service providers to leverage the spectrum in a manner that best serves the evolving demands of the industry.

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:

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)



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DEN Broadband Limited

CIN: U74140DL2011PLC228312

Regd. Office: 236, Okhla Industrial Estate, Phase-III, New Delhi -110 020

Landline: +91 11 40522100 || Facsimile: +91 11 40522203 || E-mail: denbroadband@denonline.in ||

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			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										
IFMC										
Any other relevant service (please specify)										

Response:-

Please refer to the response provided for Question 1, which advocates for the adoption of a technology-agnostic assignment approach (i.e. any technology can be deployed in an auctioned assigned spectrum). This approach eliminates the need to assess spectrum demand on a per-service basis, as requested in this question. By allowing the spectrum to be used for any technology, the allocation process can align with the actual demand and promote the efficient utilization of this valuable resource.



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DEN Broadband Limited

CIN: U74140DL2011PLC228312

Regd. Office: 236, Okhla Industrial Estate, Phase-III, New Delhi -110 020

Landline: +91 11 40522100 || Facsimile: +91 11 40522203 || E-mail: denbroadband@denonline.in ||

www.denbroadband.com

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.

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.

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.**
- (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?**
- (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.**
- (d) Any other suggestions to ensure 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.

Response:-

The rapid technological advancements in space-based communication services necessitate the exclusive assignment of spectrum through auctions. For example, in the case of Non-Geostationary Orbit (NGSO) constellations, the positions of satellites are not fixed relative to the Earth. Furthermore, the presence of multiple satellites within each constellation adds further complexity. In such intricate scenarios, it becomes extremely challenging to achieve spectrum sharing between two NGSO constellations. Achieving coexistence under such circumstances is practically unattainable through non-exclusive spectrum assignments.

Hence, it is crucial to adopt an exclusive assignment approach through auctions for space-based communication services. This entails assigning spectrum frequency blocks (i.e. chunks of spectrum formed by segmenting a spectrum band) exclusively to individual entities.

DEN Broadband Limited

CIN: U74140DL2011PLC228312

Regd. Office: 236, Okhla Industrial Estate, Phase-III, New Delhi -110 020

Landline: +91 11 40522100 || Facsimile: +91 11 40522203 || E-mail: denbroadband@denonline.in ||

www.denbroadband.com



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However, in cases where service providers determine that it is technically feasible and mutually beneficial to share spectrum among themselves, they should have the flexibility to do so. This approach mirrors how spectrum sharing functions in terrestrial cellular services, where sharing arrangements are determined through mutual agreements driven by market forces, without requiring government intervention.

By allowing service providers to engage in voluntary spectrum sharing based on their own agreements, the industry can effectively adapt to evolving demands and optimize the utilization of spectrum resources. This approach empowers service providers to make collaborative decisions that best suit their specific needs, promoting flexibility and efficiency in spectrum management.

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.

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.

Response:-



DEN Broadband Limited

CIN: U74140DL2011PLC228312

Regd. Office: 236, Okhla Industrial Estate, Phase-III, New Delhi -110 020

Landline: +91 11 40522100 || Facsimile: +91 11 40522203 || E-mail: denbroadband@denonline.in ||

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The regulatory framework should facilitate the sharing, trading, and leasing of auctioned spectrum among service providers holding relevant service licenses issued by the Government of India.

Advantages of the above framework are as follows:

- a. **Enables Spectrum Utilization:** The framework allows a service provider to utilize spectrum, even if they have not won spectrum in the auction, by entering into an arrangement with a service provider who has secured auctioned spectrum. This promotes efficient spectrum utilization and ensures that the available spectrum resources are put to optimal use.
- b. **Efficient Spectrum Management:** The framework enables the utilization of any idle spectrum, if available in specific areas or pockets, by allowing service providers to share, trade, or lease it among themselves. This approach prevents spectrum from lying dormant and maximizes its use, leading to more efficient spectrum management.
- c. **Increased Market Value:** By facilitating spectrum sharing, trading, and leasing, the framework enhances the market value of spectrum. It allows service providers to leverage the spectrum resources more effectively, thereby maximizing their value and contributing to the overall growth and competitiveness of the telecom sector. By adopting such a framework, the industry can benefit from improved spectrum utilization, enhanced efficiency in spectrum management, and increased market value of spectrum resources.

Moreover, the government has already taken the decision to conduct spectrum auctions annually, ensuring that the requirements of new entrants are met and providing existing players with the opportunity to acquire more frequencies when needed. In order to incentivize service providers and enable them to realize returns on their infrastructure investments, it is crucial that the spectrum assignment period aligns with the current 20-year period applicable to terrestrial services.

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.

Response:-

The assignment of frequency slots should be carried out in a transparent and fair manner, relying on a market-based approach i.e. based on auction outcome. It is recommended that the assignment of frequencies be based on the final ranking of bidders in the auction process. This means that bidders should have the opportunity to choose their frequency slots based on their respective ranks.



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DEN Broadband Limited

CIN: U74140DL2011PLC228312

regd. Office: 236, Okhla Industrial Estate, Phase-III, New Delhi -110 020

Landline: +91 11 40522100 || Facsimile: +91 11 40522203 || E-mail: denbroadband@denonline.in ||

www.denbroadband.com

By aligning the frequency assignment with the ranking of bidders, the process ensures fairness and efficiency. This approach also encourages competition and enables service providers to align their spectrum holdings with their specific business requirements.

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.

Response:-

As mentioned in the preface and in response to previous questions, it is crucial to assign spectrum exclusively through auctions for space-based communication services.

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.

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.

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.

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.

Response:



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DEN Broadband Limited

CIN: U74140DL2011PLC228312

Regd. Office: 236, Okhla Industrial Estate, Phase-III, New Delhi -110 020

Landline: +91 11 40522100 || Facsimile: +91 11 40522203 || E-mail: denbroadband@denonline.in ||

www.denbroadband.com

The consultation paper highlights that the frequencies 27.5-28.5 GHz and 28.5-29.5 GHz, can be utilized by both space-based and terrestrial-based services. Acknowledging this overlap in frequency usage, it is crucial to ensure that the spectrum assignment through auctions in this range allows for flexible utilization by both IMT (International Mobile Telecommunications) and space-based services in flexible manner based on the market requirements. This flexibility in spectrum allocation will promote the efficient utilization of spectrum.

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:

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

(a) 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:

Type of service:			
Financial Year	Revenue (Rs. lakh)	Subscriber base	CAPEX for the year (Rs. lakh)
2023-24			
2024-25			
2025-26			



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2026-27			
2027-28			

Response -

As mentioned in the preface and in responses to previous questions, in order to facilitate the participation of a diverse range of service providers, spectrum assigned through auctions should be allowed to be used for the deployment of any technology in both terrestrial and space-based networks.

By enabling service providers to utilize the assigned spectrum for any technology, it promotes an inclusive and competitive environment in the telecom sector. This approach allows for flexibility and innovation, as service providers can deploy the technologies that best meet their specific requirements and cater to the evolving needs of consumers.

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.

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.

Response -

It is reiterated that spectrum for space-based communication services (except spectrum within C-Band that serves the current teleports/broadcasting operations), should be assigned through auctions on exclusive basis. The consultation paper also highlights the stance taken by the Honourable Supreme Court in the 2G case, which emphasized that a scarce natural resource like spectrum should



DEN Broadband Limited

CIN: U74140DL2011PLC228312

Regd. Office: 236, Okhla Industrial Estate, Phase-III, New Delhi -110 020

Landline: +91 11 40522100 || Facsimile: +91 11 40522203 || E-mail: denbroadband@denonline.in ||

www.denbroadband.com

be assigned only through auctions. DoT has sought the TRAI's recommendation on the framework for conducting auctions of spectrum for space-based communication services and does not contemplate administrative assignment of spectrum.

As mentioned in the preface to this response, it is crucial to assign spectrum through auctions for space-based communication services, considering that they are now comparable to terrestrial communication services and can directly provide services to consumers on their devices. Therefore, it is necessary to assign spectrum for space-based communication services only through competitive bidding in auctions, at the market driven price. This approach ensures transparency and market-driven assignment of spectrum, promoting competition and providing a level playing field for all stakeholders.

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

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.

Response -

The assignment of spectrum for user links in both NGSO (Non-Geostationary Orbit) and GSO (Geostationary Orbit) space-based communication services should be **through auctions on an exclusive basis at the national level.**

As mentioned in the response to Question 5, it is essential to auction frequency blocks for the NGSO constellation for exclusive assignment to ensure interference free operations. Regarding GSO systems, the consultation paper highlights that the satellites positioned at a minimum angular separation can utilize the same frequency. Therefore, for GSO, the same frequency can be auctioned for different orbital positions with a minimum angular separation (to be determined after considering technical aspects).

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.



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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.

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.

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?

Response -

Gateway links typically require more bandwidth and are confined to specific locations or zones. Based on these considerations, it is recommended that the spectrum for gateway links be auctioned separately, with the entire spectrum in a particular band assigned for gateway links at the designated gateway location. To avoid interference between the gateway and user links operating on the same frequency, user links will not be permitted to operate within the spectrum assignment zone designated for gateway links.

Thus, the Option #2, i.e. assignment of gateway spectrum through auction for identified areas/ regions/ districts is recommended for assignment of spectrum for gateway links. These locations may be kept exclusive to the gateway operations only.

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?



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(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.

Response –

As enunciated in the responses to previous questions, the validity of the spectrum assignment for auctioned spectrum should be 20 years. The auctions should be held annually.

For DEN Broadband Limited



Authorized Signatory



DEN Broadband Limited

CIN: U74140DL2011PLC228312

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