02nd July 2025

Mr. Akhilesh Kumar Trivedi,
Advisor (NSL)
Telecom Regulatory Authority of India
4th, 5th, 6th & 7th Floor, Block-F
World Trade Centre, Nauroji Nagar
New Delhi – 110029

Subject: Consultation Paper on Assignment of the Microwave Spectrum in 6 GHz (lower), 7 GHz, 13 GHz, 15 GHz, 18 GHz, 21 GHz Bands, E-Band, and V-Band

Dear Sir,

This is in reference to the consultation paper issued by the Authority on 28th May 2025 regarding "Assignment of the Microwave Spectrum in 6 GHz (lower), 7 GHz, 13 GHz, 15 GHz, 18 GHz, 21 GHz Bands, E-Band, and V-Band"

In this regard, we, Tata Teleservices Limited (TTSL) and Tata Teleservices (Maharashtra) Limited [together called "TTL"] hereby enclose our response to the questions raised in your above-mentioned Consultation Paper.

We believe TTL response will be given due consideration.

Thanking you,

Yours sincerely

Mukesh Dhingra
General Manager – Corporate Regulatory Affairs
Tata Teleservices Limited
And
Authorized Signatory
For Tata Teleservices (Maharashtra) Limited

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Consultation Paper on Assignment of the Microwave Spectrum in 6 GHz (lower), 7 GHz, 13 GHz, 15 GHz, 18 GHz, 21 GHz Bands, E-Band, and V-Band

We thank the Authority for bringing out this timely and comprehensive consultation on the assignment of microwave and millimetre-wave spectrum across traditional backhaul bands and emerging mm Wave bands such as E-Band and V-Band. As a Unified License (UL) holder with Access service authorization, we would like to offer our views on the proposed assignment, usage, and pricing of these bands, with emphasis on their criticality for backhaul, enterprise services, and broadband growth.

The microwave spectrum bands under consultation are of strategic importance for access service provider also offering enterprise wireline services, particularly in building scalable and cost-efficient backhaul connectivity. Traditional bands like 6–21 GHz continue to be essential for point-to-point backhaul, especially in areas where fiber is not economically viable or where rapid deployment is necessary. Meanwhile, E-Band and V-Band, owing to their wide bandwidth and high throughput capacity, are well-suited for urban and semi-urban deployment scenarios, enabling high-speed enterprise-grade connectivity.

We strongly believe that a well-structured, affordable, and interference-managed assignment of these bands will significantly improve the wireline operator's ability to serve new demand for leased line and SLA-based internet services apart from other enterprise use cases. In particular, E-Band offers an excellent alternative to fiber for short distance backhaul in high-rise urban environments, while V-Band enables short-range gigabit connectivity for access and campus-wide deployments. The flexibility to use these bands for backhaul through administratively assigned spectrum and delicensing of V band along with pricing framework which is based on MxCxW model for traditional MW bands except for E Band where it is proposed to charge basis per MHz.

We recommend that TRAI consider administrative assignment for traditional microwave bands with nominal charges. These should not be subjected to auction. We also request TRAI to keep spectrum charges reasonable, delinked from AGR-based models.

In conclusion, we welcome TRAI's consultative approach and reiterate that affordable, interference-free access to microwave and mm Wave spectrum will greatly empower access operators offering wireline enterprise customers, to scale up its network reach and contribute to the Digital India mission through hybrid fiber-wireless deployments.

Issues for Consultation:

Question 1: What is the level of demand of the spectrum in the traditional microwave backhaul bands [viz. 6 GHz (lower), 7 GHz, 13 GHz, 15 GHz, 18 GHz, and 21 GHz bands] for radio backhaul purposes? Kindly provide a detailed response with justifications.

TTL Response: Backhaul links are essential for extending connectivity to areas where fiber optic deployment is currently not feasible. Even in metropolitan areas, there are specific pockets

where laying fiber remains a challenge due to infrastructure constraints, right-of-way issues, or high deployment costs. In metros and Category B cities, the estimated requirement is approximately 100 to 150 links to extend the customer reach and capacity requirements for Enterprise Network backhaul considering commercial viability of establishing such links.

- The necessity for robust and affordable backhaul solutions is greater in areas where fiber deployment faces geographical challenges, very high RoW costs and non-availability of approval to lay optical fiber links.
- Rapid urbanization and network densification require solutions that can cover larger areas within shorter timelines and at lower costs.

Question 2: For which commercial telecommunication services should the spectrum in traditional microwave backhaul bands be assigned for radio backhaul purposes? Kindly provide a detailed response with justifications.

TTL Response: Spectrum is required to provide connectivity for delivering Commercial Enterprise services primarily for Internet Leased Lines, MPLS, Data links and Enterprise Voice PRI/SIP. At the same time, it should be left to the discretion of the TSP on how the spectrum is used based on network topology, commercial use case. Enterprises are moving their operations to remote locations, many of which are not served on fiber and only Unlicensed band radios with limited bandwidth, which is prone to severe interference, is the only solution to connect. It reduces the QoS for the enterprise customer which is the main deliverables for such segment of customers. Enterprises require connectivity to their offices in remote locations with good quality connectivity. As these locations are not connected on Fiber and still need connectivity for High Bandwidth services - there is the need to provide connectivity using Licensed Microwave to meet quality services requirements.

Microwave Backhaul is required to connect between TSP's PoP to PoP and last mile connectivity to end customer is extended on fiber/ethernet/copper.

Question 3: Which of the following methods should be used for the assignment of the spectrum in traditional microwave backhaul bands for radio backhaul purposes for various Commercial telecommunication services:

(a) Block-basis in LSA,

(b) Point-to-point link-basis, or

(c) Any other?

Please provide a detailed response with justifications in respect of e relevant Commercial telecommunication services.

TTL Response: Given the specific and localized nature of these requirements, it is appropriate to consider City wise, administratively assigned spectrum as one or more carrier, as per the requirement of the TSP. As far as charging is concerned, it is suggested to charge the spectrum

on the basis of formula of M x C x W with no AGR to make it commercially viable for TSPs serving enterprise customers. The links for intercity backhaul should be considered as Point to point link basis This would allow service providers to optimize spectrum usage based on actual operational needs, while ensuring efficient and interference-managed backhaul and enterprise service delivery. Advance assignment of Carrier will enable the TSP to plan its inventory, deployment and delivery plan efficiently and hence better service support to customers. This charging model and allocation on Town/City base framework would align well with the need of enterprise use case for quick deployment, affordable, and high service reliability in non-fiberized or infrastructure-challenged locations.

Question 4: In case it is decided to use different methods (block-based, link based, or any other) for the assignment of the spectrum in traditional microwave backhaul bands for radio backhaul purposes for different types of Commercial telecommunication services, what quantum of spectrum, and in which of 6 GHz (lower), 7 GHz, 13 GHz, 15 GHz, 18 GHz, and 21 GHz bands should be earmarked for point-to-point link-based assignments? Kindly provide a detailed response with justifications.

TTL Response: Backhaul throughput requirements are increasing year-on-year, driven by growing data consumption, enterprise connectivity demands, and the expansion of high-speed broadband services to newer areas or locations which are non-feasible due to commercial or any other reason not in control of TSP. Traditional microwaves backhaul solutions, are increasingly falling short of meeting current and future throughput needs due to their inherent bandwidth The minimum allocation for backhaul should support at least 1 Gbps full duplex throughput, with provisions to scale upward as demand grows. Such scalability should be allowed for the existing spectrum holder, provided there is no interference or overlap with allocation to other users. This approach ensures optimal spectrum utilization while accommodating the evolving capacity requirements of service providers, particularly in scenarios where fiber connectivity is unavailable or economically unviable. To meet such requirements, it is suggested to allocate 2 contiguous carriers of 28MHz each (56MHz) in all the 6 Bands.

Question 5: What should be the terms and conditions for the assignment of spectrum in traditional microwave backhaul bands for radio backhaul purposes of various Commercial telecommunication services, such as -

(a) Carrier size.

(b) Carrier aggregation.

(c) Validity period of the assignment.

(d) Renewal mechanism.

(e) Roll-out obligations; and

(f) Surrender of spectrum etc.?

Kindly provide a detailed response with justifications. along with the international scenario on the matter

TTL Response: The carrier size for microwave spectrum assignment should be designed in such a way that it enables a minimum starting throughput of 1 Gbps duplex which can be achieved by 2 contiguous carriers of 28MHz each (56MHz) in all the 6 Bands. To meet higher bandwidth requirements, Telecom Service Providers (TSPs) should be permitted to utilize carrier aggregation, allowing them to acquire and combine additional carriers as needed based on traffic demands and network growth.

The validity period of the assigned spectrum may be considered till the validity of licence or surrender whichever is earlier. This is in line with the targeted nature of such deployments, which are fundamentally different from large-scale mobile access networks that require wide-area coverage.

Additionally, TSPs should be allowed to surrender any link by providing a prior notice of 1 month. This provision would support efficient spectrum usage while reducing operational burden on service providers in cases where links are no longer required.

Unlike LSA wide spectrum assignment, the assignment of Spectrum Town/city wise model, which will enable TSPs to plan procurement of spectrum only where it is required and this will ensure that there will be efficient use of spectrum and hence rollout obligation enforcement will not be required. As we are serving enterprise customers therefore, link establishment is based on requirement of customers for connectivity, therefore rollout obligation cannot be directly established.

Question 6: Is there a need to prescribe ceilings on the number of carriers that can be assigned to a Commercial telecommunication service provider in each frequency band [6 GHz (lower)/ 7 GHz/ 13 GHz/ 15 GHz/ 18 GHz/ 21 GHz] or in a group of frequency bands for radio backhaul purposes? Kindly provide a detailed response with justifications.

Question 7: In case it is decided to prescribe ceilings on the number of carriers that can be assigned to a commercial telecommunication service provider (TSP) for each frequency band or each group of frequency bands, -

(a) Should there be any criterion for the ceiling on the number of carriers that may be assigned to a TSP? If yes, what should be the criteria?

(b) In case of group of frequency bands, how should the bands be grouped?

(c) What should be the respective ceilings for each frequency band, or each group of frequency band(s)?

(d) Should there be any provision for assignment of spectrum above the ceiling limit on a case-by-case basis? If yes, what criterion should be prescribed, based on which, additional spectrum above the ceiling limit may be assigned to a telecom service provider?

Kindly provide a detailed response with justifications.

TTL Response: There should be ceiling on the number of carriers that can be assigned to a Commercial Telecommunication Service provider for radio backhaul. With the continuous growth in data traffic and evolving enterprise needs, throughput requirements are increasing significantly. TSPs must be allowed to scale capacity as needed by utilizing all available carriers supported by their radio equipment. Imposing a limit would restrict a TSP to obtain full band of available spectrum, thus pave way to level playing field. It is therefore suggested that one TSP should not hold more than 40% of the available carrier in any given band.

Question 8: In the new policy regime for the assignment of spectrum, whether there is a need to grant an option to telecom service providers already holding carriers in traditional microwave backhaul bands to retain the existing carriers with them? Kindly provide a detailed response with justifications.

TTL Response: TSPs holding carriers in traditional microwave backhaul bands should be granted the option to retain their existing assignments under the new regime; Authority should ensure that they do not hold more spectrum than what is approved (ceiling for a TSP), so that new entrants are also able to build their own network.

Question 9: As the 7125-8400 MHz range in the 7 GHz band and the 14.8-15.35 GHz range in the 15 GHz band are being considered for IMT in WRC27, whether there is a need to review the usage of 7 GHz and 15 GHz microwave backhaul bands at this stage itself, or should the review be undertaken after considering the outcome of WRC-27? Kindly provide a detailed response with justifications.

TTL Response: A review of spectrum allocation and assignment policy, particularly for bands under international consideration or study, may be best undertaken after the outcome of WRC-27. This is to ensure that any global harmonisation decisions, reallocation, or changes in usage rights emerging from WRC-27 are appropriately factored into the national framework.

Premature changes or reassignments could adversely impact TSPs who may receive spectrum allocations from these bands and be compelled to alter or relocate their existing deployments, resulting in operational and financial disruptions.

Therefore, to provide regulatory stability and protect ongoing and planned investments, it is prudent to defer any major policy shifts or band repurposing decisions until after the WRC-27 conclusions are available and evaluated.

Question 10: In case it is decided to review the usage of 7 GHz and 15 GHz bands at this stage itself, what should be the policy framework for the assignment of the spectrum in 7 GHz and 15 GHz microwave backhaul bands to take care the possible outcomes of AI 1.7 of the WRC-27? Kindly provide a detailed response with justifications.

TTL Response: No comments.

Question 11: Whether there is a need to earmark certain quantum of spectrum in traditional microwave backhaul bands for the last-mile connectivity (Fixed Wireless Access) to the customer equipment of Commercial telecommunication services? Please provide a detailed response with justifications.

Question 12: In case it is decided to earmark certain quantum of spectrum in traditional microwave backhaul bands for the last-mile connectivity (Fixed Wireless Access) to the customer equipment of Commercial telecommunication services, -

(a) What quantum of spectrum, and in which of 6 GHz (lower), 7 GHz, 13 GHz, 15 GHz, 18 GHz, and 21 GHz bands should be earmarked for such purposes?

(b) What should be the eligibility conditions to obtain the spectrum in traditional microwave backhaul bands for such purposes?

(c) What should be the terms and conditions for the assignment of spectrum in traditional microwave backhaul bands for such purposes through auction such as-

(i) Block size.

(ii) Minimum quantity for bidding.

(iii) Spectrum cap.

(iv) Validity period of the assignment.

(v) Roll-out obligations.

(vi) Surrender of spectrum etc.?

(d) Whether flexible use i.e., both backhaul connectivity, and last mile connectivity (fixed wireless access) to the customer equipment should be permitted in the frequency ranges earmarked for such purposes? If yes, should the terms and conditions of the auction of spectrum be the same as those applicable for the "access spectrum"? Kindly provide a detailed response with justification and international practice.

TTL Response: For Enterprise customers, these carriers will be used between one POP of TSP to another POP of TSP and last mile of the customer will be extended on fiber/ethernet/copper therefore there is no requirement to earmark any spectrum for FWA in these bands.

Question 13: Should a certain quantum of the spectrum in traditional microwave backhaul bands be earmarked for fulfilling point-to-point connectivity requirements of captive (non-Commercial/ non-TSP) users? If yes -

(a) What quantum of spectrum, and in which of 6 GHz (lower), 7 GHz, 13 GHz, 15 GHz, 18 GHz, and 21 GHz bands should be earmarked for such purposes?

(b) What should be the terms and conditions for the assignment of spectrum for such purposes, such as-

(i) Carrier size.

(ii) Carrier aggregation.

(iii) Ceiling on the number of carriers.

(iv) Validity period of the assignment.

(v) Renewal mechanism.

(vi) Criteria for the assignment of additional spectrum above the ceiling limit.

(vii) Roll out obligations; and

(viii) Surrender of the spectrum, etc.?

Kindly provide a detailed response with justifications.

Question 14: In case your response to Q13 is 'no', in what manner should the point-to-point connectivity requirements of captive (non- Commercial/ non-TSP) users be fulfilled? Kindly provide a detailed response with justifications.

TTL Response: No Comments

Question 15: In case it is decided to assign the spectrum in traditional microwave backhaul bands on a point-to-point link basis to cater to point-to point connectivity requirements of Commercial telecommunication service providers as well as captive (non-Commercial/ non-TSP) users, whether there is a need to prescribe minimum link lengths (path lengths) in these bands? If yes, what should be the minimum link length for each of the traditional microwave backhaul bands? Kindly provide a detailed response with justifications.

TTL Response: The prescription of a minimum link distance for a particular frequency band may not be appropriate, as it could unnecessarily restrict deployment flexibility. Service providers should be allowed to choose the most suitable equipment and network design based not only on distance, but also on factors such as capacity requirements, interference environment, path profile, and customer-specific needs.

Allowing flexibility in link distance enables optimal use of advanced radio technologies and ensures that spectrum is efficiently utilized across a variety of deployment scenarios, including dense urban areas, short-hop links, and capacity-sensitive environments.

Question 16: Considering that the Government has decided to delicense the 6 GHz (lower) band (5.925-6.425 GHz) for low power applications, whether there is any need to prescribe certain measures to provide necessary protection to incumbent users such as Fixed Microwave (backhaul) Services, Fixed Satellite Service (FSS) etc. operating in the 6 GHz

(lower) band? If yes, which specific measures should be prescribed for this purpose? Kindly provide a detailed response with justifications.

TTL Response: No comments

Question 17: Any other suggestions relevant to the assignment of spectrum in 6 GHz (lower), 7 GHz, 13 GHz, 15 GHz, 18 GHz, and 21 GHz bands may kindly be provided with detailed justifications.

TTL Response: No comments

Question 18: What is the level of demand of the spectrum in the E-band (71-76 GHz, and 81-86 GHz) for each of the service/ usage viz. "Backhaul", "Access" and "Integrated Access & Backhaul (IAB)"? Kindly provide a detailed response in respect of each service/ usage with justification including availability of Network standards and ecosystem.

TTL Response: In metro and Category B cities, connectivity requirements often arise in specific pockets and on the outskirts, where laying fibre may not be immediately feasible or cost-effective. Typically, higher bandwidths cannot be efficiently delivered using Unlicensed Band Radios (UBR) due to limitations in capacity and interference.

As bandwidth requirement extends from 1Gbps and above, E-Band offer viable alternatives for short-distance point-to-point links, including for use in Integrated Access and Backhaul (IAB) scenarios. These bands are well-suited for such deployments due to their high capacity and suitability for dense urban or semi-urban environments where rapid, fibre-like connectivity is needed.

Therefore, E-Band should be actively considered and encouraged for point-to-point IAB use cases in such areas.

Question 19: What is the level of demand of the spectrum in the V-band (57-64/ 66 GHz) for each of the service/ usage viz. Backhaul, Access and IAB? Kindly provide a detailed response in respect of each service/usage with justification including availability of Network standards and eco-system.

TTL Response: The V-Band is well-suited for short-distance point-to-point connectivity, especially in areas where fibre deployment is not feasible due to physical constraints or right-of-way issues.

However, beyond such short-range applications, the practical utility of V-Band for point-to-point links is limited, primarily due to its high propagation losses and susceptibility to atmospheric conditions.

Therefore, while V-Band can play a crucial role in addressing last-mile or gap-fill requirements, its usage for point-to-point connectivity should be considered mainly for short-range, high-capacity links where fibre cannot be deployed. Delicensing V Band also should be considered.

Question 20: For which Commercial telecommunication services should the spectrum in E-band and V-band be assigned for radio backhaul purposes? Responses with detailed justifications may kindly be provided for E-band and V-band separately.

TTL Response: Spectrum should be assigned on a point-to-point basis for Commercial Enterprise services such as Internet Leased Lines, MPLS, Data Links, and Enterprise Voice (PRI/SIP), as these services require dedicated and reliable connectivity.

In cases where a single hub radio equipment is used to connect to multiple network POP Locations, each link should be treated as an individual point-to-point connection, since each path requires separate line-of-sight alignment and spectrum coordination.

Recognising these as separate links ensures accurate spectrum planning, better interference management, and reflects the actual network deployment and usage patterns of enterprise-grade services.

Question 21: Which of the following methods should be used for the assignment of the spectrum in E-band and V-band for radio backhaul purposes for various Commercial telecommunication services:

(a) Block-basis in LSA

(b) Point-to-point link-basis; or

(c) Any other?

Responses with detailed justifications may kindly be provided for E-band and V-band separately in respect of the relevant Commercial telecommunication services.

TTL Response: For Commercial Telecommunication Services, spectrum assignment should follow as one or more carrier, city wise as requested by TSP charged with per MHz basis. No AGR and City wise assignment will enable faster and affordable delivery of links to customers.

Moreover, since such links are not required ubiquitously across an entire service area, but only at specific towns, assigning spectrum on a block basis in Licensed Service Areas (LSA) would lead to inefficient use of spectrum and unnecessary blocking of resources.

For V Band, unlicensed approach may also be considered.

Question 22: In case it is decided to use different methods (block-based, link based, or any other) for the assignment of the spectrum in E-band and/ or V-band for radio backhaul purposes for different types of Commercial telecommunication services, how much spectrum in E-band and V-band should be earmarked for the point-to-point link based assignment for radio backhaul purposes for Commercial telecommunication services? Responses with justifications may kindly be provided for E-band and V-band separately.

TTL Response: E band: 250 MHz carrier. There should be ceiling on the number of carriers that can be assigned to a Commercial Telecommunication Service provider used for radio backhaul. With the continuous growth in data traffic and evolving enterprise needs, throughput requirements are increasing significantly. TSPs must be allowed to scale capacity as needed by utilizing all available carriers supported by their radio equipment. Imposing a limit would restrict a TSP to obtain full band of available spectrum, thus pave way to level playing field. It is therefore suggested that one TSP should not hold more than 40% of the available carrier in any given band.

V Band may be considered for Delicensing.

Question 23: What should be the terms and conditions for the assignment of the spectrum in the E-band for radio backhaul purposes of Commercial telecom services such as-

(i) Band plan

(ii) Carrier size

(iii) Carrier aggregation

(iv) Validity period of the assignment

(v) Renewal mechanism

(vi) Surrender of the spectrum

(vii) Ceiling on the number of carriers (spectrum cap)

(viii) Criteria for the assignment of additional spectrum above the ceiling limit; and

(ix) Roll-out obligations etc.?

Kindly provide a detailed response with justifications.

TTL Response: Carrier Size can be 250MHz. TSPs should be allowed to aggregate additional carriers as needed to meet capacity requirements.

The validity period for spectrum assignment till the validity of licence or surrender whichever is earlier, with annual renewal. Since spectrum is assigned on a point-to-point basis, no rollout obligations are necessary.

TSPs should be permitted to surrender spectrum with one month's notice.

Question 24: What frequency range (57-64 GHz, or 57-66 GHz) in the V-band should be adopted for radio backhaul purposes? In case you are of the opinion that the 57-66 GHz range should be adopted for radio backhaul purposes, considering that the 66-71 GHz range is already identified for IMT, whether there is a need for provisioning a guard band between the 57-66 GHz range (for the backhaul purposes) and the 66-71 GHz range (for IMT)? If yes, what should be the guard band? Kindly provide a detailed response with justifications.

TTL Response: No comments

Question 25: What should be the terms and conditions for the assignment of the spectrum in the V-band for radio backhaul purposes of Commercial telecom services including the following aspects:

(i) Band plan

(ii) Carrier size

(iii) Carrier aggregation

(iv) Validity period of the assignment

(v) Renewal mechanism

(vi) Surrender of the spectrum

(vii) Ceiling on the number of carriers (spectrum cap)

(viii) Criteria for the assignment of additional spectrum above the ceiling limit; and

(ix) Roll-out obligations etc.?

Kindly provide a detailed response with justifications

TTL Response: V Band should be considered for delicensing.

Question 26: In case it is decided to earmark a few carriers in E-band and/ or Vband for services/ usages as "Access" and/ or "Integrated Access & Backhaul (IAB)", -

(a) What quantum of spectrum in E-band and V-band should be earmarked for such services/ usages?

(b) What should be the eligibility conditions to obtain the spectrum in E-band and V-band for such services/ usages?

(c) What should be the terms and conditions for the assignment of spectrum in E-band and V-band through auction such as-

(i) Block size

(ii) Minimum quantity for bidding

(iii) Spectrum cap

(iv) Validity period of the assignment

(v) Roll-out obligations; and

(vi) Surrender of spectrum etc.?

(d) Should flexible use [i.e., radio backhaul, and last mile connectivity (fixed wireless access) to the customer equipment] be permitted in frequency ranges earmarked in E-band and/ or V-band for such services/ usages? If yes, should the terms and conditions of the auction of spectrum be the same as those applicable for "access spectrum"? Responses with detailed justifications and international practices may kindly be provided for E-band and V-band separately.

TTL Response: E and V band should be considered through administrative allotment, and no auction route should be followed to offer affordable services. There are multiple enterprise use cases which require higher bandwidth at shorter distance. For Enterprise customers, these carriers will be used between one POP of TSP to another POP of TSP and last mile of the customer will be extended on fiber/ethernet/copper therefore there is no requirement to earmark any spectrum for FWA in these bands.

V Band should be considered for delicensing.

Question 27: Whether there is a need for earmarking certain quantum of spectrum in E-band and V-band for point-to-point connectivity requirements of captive (non-Commercial/ non-TSP) users? If yes, -

(a) What quantum of spectrum in E-band and V-band should be earmarked for such purposes?

(b) What should be the terms and conditions for the assignment of spectrum such as:

(i) Carrier size

(ii) Carrier aggregation

(iii) Ceiling on the number of carriers

(iv) Validity period of the assignment

(v) Renewal mechanism

(vi) Criteria for the assignment of additional spectrum above the ceiling limit

(vii) Roll out obligations; and

(viii) Surrender of the spectrum etc.?

Responses with detailed justifications may kindly be provided for E-band and V-band separately.

TTL Response: No Comments

Question 28: In case your response to Q27 is 'no', in what manner should the point-to-point connectivity requirements of captive (non-Commercial/ non-TSP) users be fulfilled? Kindly provide a detailed response with justifications.

TTL Response: No Comments

Question 29: Whether it is feasible to allow low power indoor consumer device to-consumer device usages on a license-exempt basis in the V-band in parallel to the use of the spectrum by telecom service providers for the establishment of terrestrial networks in a part or full V-band? Kindly provide a detailed response with justification and international scenario.

TTL Response: The V-Band is suitable for short-distance point-to-point connectivity, especially in cases where fiber deployment is not feasible due to physical, logistical, or regulatory constraints.

However, due to its high propagation loss and sensitivity to atmospheric conditions, V-Band has limited application beyond short-range links. Therefore, its use for point-to-point connectivity should be considered primarily for short-distance, high-capacity scenarios where other options are not practical. A license exempt regime may be considered for V Band.

Question 30: In case it is decided to allow low power indoor consumer device-to device usages on a license-exempt basis in the V-band (57-64/66 GHz), -

(a) Should it be permitted in the entire V-band or only in a portion of the V-band? If it should be permitted only in a portion of the V-band, please specify the frequency range.

(b) In case it is decided to permit low power indoor consumer device-to-device usages on a license-exempt basis in the entire V-band, whether the 57-64 GHz range, or the 57-66 GHz range should be considered for such usages?

(c) What should be the carrier size/ channel bandwidth?

(d) What should be the definition of indoor usages?

(e) What Network parameters should be prescribed, including

EIRP limits for low power indoor consumer device-to-device usages?

Kindly provide a detailed response with justifications and international scenario.

TTL Response: No Comments

Question 31: Whether there is a need for permitting "outdoor" usages of V-band on a license-exempt basis? Kindly provide a detailed response with justification and international scenario.

TTL Response: Device-to-device connectivity may be considered on a license-exempt basis, particularly for short-range, low-power applications that do not cause harmful interference to licensed services.

Allowing such connectivity without a license can promote innovation, enable flexible deployments, and support use cases like industrial automation, campus networks, and localized

enterprise solutions, while ensuring compliance with prescribed technical and interference norms.

Question 32: If the response to the Q31 is in the affirmative, whether it is feasible to allow outdoor usages on a license-exempt basis in the V-band in parallel to the use of the spectrum by telecom service providers for the establishment of terrestrial networks in a part or full V-band? Kindly provide a detailed response with justification and international scenario.

TTL Response: No comments

Question 33: In case it is decided to allow outdoor usages on a license-exempt basis in the V-band (57-64/ 66 GHz), -

(a) Should it be permitted in the entire V-band or only in a portion of the V-band? If it should be permitted only in a portion of the V-band, please specify the frequency range.

(b) In case it is decided to permit outdoor usages on a license exempt basis in the entire V-band, whether the 57-64 GHz range, or the 57-66 GHz range should be considered for such usages?

(c) What should be the carrier size/ channel bandwidth?

(d) What Network parameters should be prescribed, including EIRP limits for low power indoor consumer device-to-device usages?

Kindly provide a detailed response with justifications and international scenario.

TTL Response: No comments

Question 34: Any other suggestions relevant to the assignment of the spectrum in E-band (71-76/ 81-86 GHz) and V-band (57-64/ 66 GHz) may kindly be made with detailed justifications.

TTL Response: No comments

Question 35: In case the 6 (lower)/7/13/15/18/21 GHz bands for radio backhaul of various Commercial telecom services are assigned on a Point-to Point (P2P) Link basis, should the spectrum charges be levied:

i. As a percentage of Adjusted Gross Revenue (AGR), or

ii. On a per carrier/link basis, or

iii. Through any alternative mechanism (please specify)?

Kindly provide a detailed justification for the approach considered most suitable, along with the suggested percentage of AGR or the applicable per link/per carrier charge.

Question 36: In case the 6 (lower)/7/13/15/18/21 GHz bands for radio backhaul of various Commercial telecom services are assigned on a block basis for the entire Licensed Service Area (LSA), should the spectrum charges be levied:

i. As a percentage of Adjusted Gross Revenue (AGR), or

ii. On a per MHz or per carrier basis, or

iii. Through any alternative mechanism (please specify)?

Kindly provide a detailed justification for the approach considered most suitable, along with the suggested percentage of AGR or the applicable per carrier/ MHz charge

TTL Response: The primary use case for Access Service Providers serving enterprise use case, it is point-to-point (P2P) links requirements for connecting various locations in a city which are still not fiberized or does not make commercially viable to lay fiber. For such locations, P2P links are required to be established so that network POPs can be connected over backhaul. It is suggested that spectrum assignment for Commercial Telecommunication Services should follow as one or more carrier allocation city wise as requested by TSP and charged with a formula-based model and with no AGR, ensuring efficient and need-based spectrum utilisation.

Question 37: In case it is decided to assign some frequency spectrum in 6 (lower)/7/13/15/18/21 GHz spectrum bands for last mile connectivity (Fixed Wireless Access) of Commercial telecom services through auction, then:

i. Should the auction determined price of other bands by using spectral efficiency factor serve as a basis of valuation for the above bands? If yes, which spectrum bands be related, what efficiency factor or formula should be used and what is the basis for the same? Please justify your suggestions.

ii. If response to question

(i) above is no, what other methodology may be used. Please justify your suggestions.

TTL Response: It should be administratively allocated spectrum with charging model as covered in Q35.

Question 38: In case it is decided to assign some frequency spectrum in 6 (lower)/7/13/15/18/21 GHz spectrum bands for last mile connectivity (Fixed Wireless Access) of Commercial telecom services through auction, then:

i. Should the auction determined price of other countries in 6/7/13/15/18/21 GHz spectrum bands for last mile connectivity and/or IMT services serve as a basis of valuation of microwave bands for last mile connectivity? What methodology should be followed for using this auction determined price as a basis for valuation? Support your suggestions with justifications and country-wise auction data.

ii. If the above approach is considered appropriate, should the international auction-determined prices be normalized to account for cross-country differences such as population, GDP, purchasing power parity (PPP), subscriber base, and other relevant factors? If so, should normalization be carried out by using the ratio of auction prices of spectrum bands within the same country to neutralize the impact of cross-country differences? Alternatively, please suggest any other suitable normalization methodology that may be adopted in this context.

iii. Apart from the approaches highlighted above which other valuation approaches may be adopted for the valuation of 6(lower)/7//13/15/18/21 GHz spectrum bands? Please provide detailed information.

Question 39: What valuation methodology should be followed if it is decided to assign frequency spectrum in traditional microwave backhaul bands for flexible use (i.e. both backhaul connectivity and last mile connectivity) of Commercial telecom services through auction? Please provide detailed justification.

TTL Response: Same as Q 37 response.

Question 40: Should the spectrum charges for 6 (lower)/ 7/ 13/ 15/ 18/ 21 GHz bands for non-Commercial/ captive backhaul use continue to be levied as per the M x C x W formula specified in the DoT's order No. P-11014/34/2009-PP dated 11.12.2023? Is there a need to revise this formula by inclusion of additional factors, modifying slab/factor values etc.? If yes, please specify which additional factors should be included and what should be the revised slab/factor values? Please provide detail of the same along with justification.

TTL Response: No Comments

Question 41: If the answer to above question is no, whether an alternative charging mechanism should be adopted for levying spectrum charges for 6 (lower)/ 7/ 13/ 15/ 18/ 21 GHz bands for non-Commercial/ captive backhaul use? Please provide detailed justification.

TTL Response: No comments

Question 42: In case the E-band (71-76/ 81-86 GHz) is assigned for Radio backhaul purpose for various Commercial telecommunication services and on a Point-to-Point (P2P) link basis, should the spectrum charges be levied:

i. As a percentage of Adjusted Gross Revenue (AGR), or

ii. On a per carrier/link basis, or

iii. Through any alternative mechanism (please specify)?

Kindly provide a detailed justification for the approach considered most suitable, along with the suggested percentage of AGR or the applicable per carrier/link charge.

TTL Response: Same as Q 37 response

Question 43: In case the E-band (71-76/ 81-86 GHz) is assigned for Radio backhaul purpose for various Commercial telecommunication services and on a block basis for the entire Licensed Service Area (LSA), should the spectrum charges be levied:

i. As a percentage of Adjusted Gross Revenue (AGR), or

ii. On a per MHz or per carrier basis, or

iii. Through any alternative mechanism (please specify)? Kindly provide a detailed justification for the approach considered most suitable, along with the suggested percentage of AGR or the applicable per MHz/per carrier charge.

TTL Response: For Commercial Telecommunication Services, spectrum assignment should follow as one or more carrier, city wise as requested by TSP charged with per MHz basis. No AGR and City wise assignment will enable faster and affordable delivery of links to customers.

Question 44: In case the V-band (57-64/66 GHz) is assigned for Radio backhaul purpose for various Commercial telecommunication services and on a Point-to-Point (P2P) link basis, should the spectrum charges be levied:

i. As a percentage of Adjusted Gross Revenue (AGR), or

ii. On a per carrier/link basis, or

iii. Through any alternative mechanism (please specify)?

Kindly provide a detailed justification for the approach considered most suitable, along with the suggested percentage of AGR or the applicable per carrier/ link charge.

TTL Response: V band should be delicensed.

Question 45: In case the V-band (57-64/66 GHz) is assigned for Radio backhaul purpose for various Commercial telecommunication services and on a block basis for the entire Licensed Service Area (LSA), should the spectrum charges be levied:

i. As a percentage of Adjusted Gross Revenue (AGR), or

ii. On a per MHz or per carrier basis, or

iii. Through any alternative mechanism (please specify)?

Kindly provide a detailed justification for the approach considered most suitable, along with the suggested percentage of AGR or the applicable per MHz/per carrier charge.

TTL Response: Same as Q 44 response

Question 46: In case it is decided to assign some frequency spectrum in E-band (71-76/ 81-86 GHz) and/or V-band (57-64/66 GHz) for Access (last mile connectivity)/ Integrated Access Backhaul (IAB) through auction, then:

(i) Should the auction determined price of other bands serve as a basis of valuation for the above bands using spectral efficiency factor? If yes, which spectrum bands be related, what efficiency factor or formula should be used and what should be the basis for the same? Please justify your suggestions

(ii) If response to question (i) above is no, what other methodology may be used? Please justify your suggestions

Question 47: In case it is decided to assign some frequency spectrum in E-band (71-76/ 81-86 GHz) and/or V-band (57-64/66 GHz) for Access (last mile connectivity)/ Integrated Access Backhaul (IAB) through auction, then:

i. Should the auction determined price of other countries in Eband (71-76/ 81-86 GHz) and/or V-band (57-64/66 GHz) serve as a basis of valuation of these bands? If yes, what methodology should be followed for using this auction determined price as a basis for valuation? Support your suggestions with justifications and country-wise auction data.

ii. If the above approach is considered appropriate, should the international auction-determined prices be normalized to account for cross-country differences such as population, GDP, purchasing power parity (PPP), subscriber base, and other relevant factors? If so, should normalization be carried out by using the ratio of auction prices of spectrum bands within the same country to neutralize the impact of cross-country differences? Alternatively, please suggest any other suitable normalization methodology that may be adopted in this context.

iii. Apart from the approaches highlighted above which other valuation approaches should be adopted for the valuation of Eband (71-76/ 81-86 GHz) and/or V-band (57-64/66 GHz)?

Please provide detailed information

TTL Response: For E band pls refer response to Q 43 and for V Band pls refer response to Q 44.

Question 48: In case it is decided to assign some frequency spectrum in E-band (71-76/ 81-86 GHz) and/or V-band (57-64/66 GHz) for point-to point connectivity requirements of captive (non-Commercial/ nonTSP) users, then:

(i) Should the spectrum charges for E-band (71-76/ 81-86 GHz) and/or V-band (57-64/66 GHz) for point-to-point connectivity requirements of captive (non-Commercial/ non-TSP) users may be levied as per the M x C x W formula as specified in the DoT's order No. P-11014/34/2009-PP dated 11.12.2023? Is there a need to revise this formula by inclusion of additional factors, modifying slab/factor values etc.? If yes, please specify which additional

factors should be included and what should be the revised slab/factor values. Please provide detail of the same along with justification.

(ii) If the answer to above question is no, whether an alternative charging mechanism such as link-to-link charges as recommended in 2014 for levying spectrum charges for E and V bands for non - Commercial/ captive backhaul use, should be adopted? Please provide detailed justification.

TTL Response: No Comments

Question 49: In case it is decided to assign some frequency spectrum in 6 (lower)/ 7/13/15/18/21 GHz spectrum bands for last mile connectivity (Fixed Wireless Access) of Commercial telecom services and in Eband (71-76/ 81-86 GHz) and/or V-band (57-64/66 GHz) for Access (last mile connectivity)/ Integrated Access Backhaul(IAB) through auction, then:

Should the value of:

(a) 6 (lower)/7/13/15/18/21 GHz bands (for last mile connectivity)

(b) E-band (71–76/81–86 GHz) and V-band (57–64/66 GHz) (for Access (last mile connectivity)/IAB) be determined using a single valuation approach? If yes, please indicate which single valuation approach or method should be adopted in each case and provide detailed justification.

TTL Response: As covered above, it is suggested that administrative allocation route should be followed with no AGR and city-based carrier allocation with formula-based charging should be adopted to offer affordable and sustainable commercial telecom services.

Question 50: 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 the above spectrum bands, or some other approach like taking weighted mean etc. should be followed? Please support your answer with detailed justification.

TTL Response: No comments

Question 51: In case it is decided to assign some frequency spectrum in 6 (lower)/ 7/13/15/18/21 GHz spectrum bands for last mile connectivity (Fixed Wireless Access) of Commercial telecom services and in Eband (71-76/ 81-86 GHz) and/or V-band (57-64/66 GHz) for Access(last mile connectivity)/ Integrated Access Backhaul (IAB) through auction, then: What ratio should be adopted between the reserve price for the auction and the valuation of the spectrum in:

(a) 6 (lower)/7/13/15/18/21 GHz bands (for last mile connectivity)

(b) E-band (71–76/81–86 GHz) and V-band (57–64/66 GHz) (for Access (last mile connectivity)/IAB) and why? Please support your answer with detailed justification.

TTL Response: No comments

Question 52: In case it is decided to assign some frequency spectrum in 6 (lower)/ 7/13/15/18/21 GHz spectrum bands for last mile connectivity (Fixed Wireless Access) of Commercial telecom services and in E-band (71-76/ 81-86 GHz) and/or V-band (57-64/66 GHz) for Access (last mile connectivity)/ Integrated Access Backhaul (IAB) through auction, then:

What should the payment terms and associated conditions for the assignment of

(a) 6 (lower)/7/13/15/18/21 GHz bands (for last mile connectivity)

(b) E-band (71–76/81–86 GHz) and V-band (57–64/66 GHz) (for Access (last mile connectivity)/IAB) relating to:

i. Upfront payment

ii. Moratorium period

iii. Total number of instalments to recover deferred payment

iv. Applicable interest rate for protecting the NPV of bid amount Please support your answer with detailed justification.

TTL Response: No comments

Question 53: Any other suggestions relevant to the subject may be submitted with detailed justification.

TTL Response: The business model of TTL is primarily focused on providing wireline telecom service to SME customers. To support its customers, who are spread from Metro to Class A, B, C city and other smaller town and Taluka, TTL has widespread network of fibre. However, there are areas where fibre network is not available due to difficult terrain, RoW issues in Metro and Class A cities etc.

As a business plan expansion, TTL is looking to expand its network reach and tap potential areas beyond its existing fiber network by deploying Microwave Radio, to support:

- New area coverage in the initial stages, until we get an adequate customer base for commercially viable business cases for fiber.
- POP to POP connectivity till building of a location hub of enterprise backhaul requirements.
- Scattered and long distant potential demand where there is no ubiquitous connectivity demand and laying of fibre is commercially not viable. However, demand exists in such areas.

With this background it makes a strong requirement for allocating MW spectrum to an access provider who does not have any wireless spectrum and is constrained to connect more locations, which are not viable/feasible currently but need to extend reach to newer locations at affordable cost to enhance digital reach and serve Small and Medium Enterprise (SME) locations connectivity. We strongly request Authority to review the practical uses cases for seeking administrative and affordable spectrum so that level playing field can be provided.