VIL/P&O/TRAI/AK/2025/059
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Advisor (Networks, Spectrum and Licensing)
Telecom Regulatory Authority of India,
4th, 5th, 6th & 7th Floor, Tower-F,
World Trade Centre, Nauroji Nagar,
New Delhi – 110029

Kind Attn: Shri Akhilesh Kumar Trivedi

Subject: Comments on the TRAI's "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" issued on May 28, 2025.

Dear Sir,

This is in reference to the TRAI's "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" issued on May 28, 2025.

In this regard, kindly find enclosed herewith comments from Vodafone Idea Limited on the abovesaid consultation paper.

We hope our comments will merit your kind consideration please.

Thanking you,

Yours sincerely,

For **Vodafone Idea Limited**

Ambika Khurana
Chief Regulatory and Corporate Affairs Officer

Enclosed: As stated above

VIL Comments to the TRAI Consultation Paper on "Assignment of Spectrum 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"

At the outset, we are thankful to the Authority for giving us this opportunity to provide our comments to the TRAI Consultation Paper on "Assignment of Spectrum 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" dated 28.05.2025.

In this regard, we would like to submit our comments for Authority's kind consideration, as given below:

Executive Summary

1. **Importance of Backhaul for access telecom networks:**

   a. With proliferations of the high capacity all IP Access networks and ever improving technologies, the TSPs have been always looking at various ways to make efficient use of the available resources. In India, wherein there is a diverse geography and a challenging infrastructure, radio backhaul offers a solution which provides a reliable communication. It enables the transmission of signals over long distances, connecting remote areas to the rest of the network.

   b. The demand for wider channels for radio backhaul will continue to grow as TSPs rollout next generation technologies or migrate the systems to new efficient networks.

   c. **To cater to the consumption levels of 4G and 5G services, the backhaul has to either move to fiber or to a dedicated high-bandwidth multiple spectrum band. As fiberization would take time, the backhaul spectrum bands including E-band, V-band as well as traditional microwave backhaul bands (MWA and MWB) have gained more prominence and usefulness as well as have become indispensable for access telecom networks.**

2. **Existing radio backhaul holdings:**

   a. The radio backhaul equipment deployed in telecom networks over last two decades are frequency spots specific. Any change in frequency spots or frequency bands, will require huge change in terms of replacement of equipment for thousands of hops as well as change in design for entire network due to different propagation characteristics and capacities.

b. **Therefore, the existing holdings of traditional microwave backhaul bands have to be protected to avoid catastrophic effects on the telecom networks, disruption of existing services to subscribers for a prolonged period as well as financial impact to TSPs.**

c. **The allocation of 15 GHz band for IMT/Access purposes must be avoided as substantial spectrum in 15 GHz is already deployed for radio backhaul across pan-India service areas. The equipment deployed is not only spectrum band specific but, also frequency spots specific. Therefore, if TSPs existing holdings in 15 GHz are not protected, it would lead to catastrophic effects on the telecom networks, disruption of existing services to subscribers for a prolonged period as well as financial impact to TSPs.**

3. **Demand of spectrum:** Considering the present pricing, the demand is expected to be 8 carriers in MWA (13/15/18/21 GHz bands), 2 carriers in MWB bands (6/7 GHz), 4 carriers in E-band and 10 carriers in V-band.

4. **Assignment at LSA level (Block-basis):** The assignment of the spectrum in all radio backhaul bands i.e. traditional microwave backhaul bands as well as E/V bands should be allocated on block-basis for entire LSA and only for radio backhaul purposes.

5. **Allocation only for backhaul and not for access/IAB:** The spectrum in traditional microwave backhaul bands as well as E/V bands should be allocated only for radio backhaul purposes. No quantum of spectrum in these bands should be earmarked for last mile connectivity (Fixed Wireless Access) or for access/IAB purposes except for 7 GHz where a review can be carried out in couple of years and unoccupied slots can be considered for IMT.

6. **Carrier Size:**

   a. **Traditional microwave backhaul bands (MWA/MWB):** 28 MHz (paired spectrum).

   b. **E-band:** 250 MHz

   c. **V-band:** 50 MHz

7. **Carrier aggregation should be explicitly allowed without any need for intimation or approval from DoT.**

8. **Ceiling of Backhaul Spectrum per LSA, for a licensee:**

   a. **Traditional microwave backhaul bands: There should be no ceiling on** the maximum numbers of carriers in MWA (13/15/18/21 GHz bands) and in MWB (6/7 GHz bands) spectrum bands, subject to the existing holdings of TSPs being protected. This will help TSPs to voluntarily move to a single band in future, which will enable equipment

synergy as well as carrier aggregation for optimum utilization of radio backhaul spectrum.

b. **E-band and V-band:** There should be a ceiling of 4 carriers of 250 MHz (paired spectrum) in E-band and 10 carriers of 50 MHz in V-band. The ceilings in E-band and V-band should not be clubbed. Unlike traditional microwave backhaul bands where there is large number of carriers available, the availability of carriers in E-band is quite limited and hence, it is important to have ceiling to ensure equitable availability for all stakeholders.

9. **Roll-out obligations:** The radio backhaul band is not a customer serving spectrum as such, no roll-out obligations should be prescribed for radio backhaul spectrum in traditional microwave backhaul bands or E/V bands.

10. **Spectrum surrender:** The existing guidelines and process of radio backhaul spectrum surrender should continue to be applicable for both traditional microwave backhaul bands as well as E/V bands and there should not be any mandatory notice period or lock-in period or any additional charges, before surrender of spectrum.

11. **No allocation to users other than Access service provider:**

    a. **There should not be any direct spectrum allocation to non-commercial/non-TSP users.** The Authority may recommend framework allowing sharing option through spectrum leasing on P2P links or geography basis.

    b. **No spectrum in V-band should be considered for any standalone low-powered indoor use.**

    c. **No spectrum in these bands should be earmarked for NLD/ISP players.**

    d. The access service provider should continue to have the flexibility of choosing which commercial telecommunication services are to be backhauled through the use of radio backhaul bands (traditional microwave backhaul bands or E/V bands), and nothing should be fixed by Licensor/Regulator.

12. **Pricing:**

    a. **Two carriers of radio backhaul should be bundled** with the different bands of access spectrum being provided through the auctions e.g. 40 MHz of 5G spectrum in 3300 MHz giving 2 carriers of E-band bundles, 5 MHz of spectrum in 1800 MHz giving 2 blocks of MWA/MWB carriers.

    b. Any additional carriers beyond above-mentioned bundled 2 carriers should be charged at a rationalized AGR based pricing.

c. The radio backhaul spectrum charges were fixed when access spectrum was provided administratively. As the access spectrum is provided at a market determined rate through auction, the backhaul spectrum pricing requires substantial rationalization.

d. **The pricing for carriers beyond 2 bundled carriers should be fixed at a rate not more than 0.05% of AGR, for one carrier in any of the traditional microwave backhaul bands and E/V bands.**

e. **The non-linear increase for additional carriers shall be done away with and uniform rate of not more than 0.05% per carrier shall be applicable for every additional radio backhaul carrier being taken by a TSP.**

In furtherance to the above, kindly find below our question- wise comments:

Question-wise Comments

Q1. 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.

VIL Comments to Q. No. 1

A. **Importance of traditional Microwave Backhaul bands**

1. As per the recent Nokia MBiT report 2025 mobile data traffic in India jumped 23% (y-o-y) in last five years and has reached 21.5 EB per month in 2024, while the average data per user per month grew over 14% to reach 27.5 GB. It is expected that with 5G as the new accelerator, the 5G data traffic may surpass 4G data traffic by Q1 2026. Owing to this the expected 5G subscribers by 2028 may be ~770 million, with an addition of ~120 million 5G subscribers annually. Delivering flawless connectivity for 5G, demands a transport backhaul that can support massive connectivity, super-high data rates and ultra-low latency.

2. To lay modern high capacity networks, TSPs require equally efficient backhaul networks to enable the customers to have an always connected experience. Due to proliferation of high data rate radio network, the need for high-density and high-capacity backhaul networks will keep on increasing every year.

3. The MWA and MWB backhaul networks are essential to deliver high performance in a cost-effective way, as we migrate to high speed data-rate modern communication system and services. With proliferations of the high capacity all IP Access networks and ever improving technologies, the TSPs we have been always looking at various ways to make efficient use of the available resources. In India, wherein there is a diverse geography and

a challenging infrastructure, radio backhaul offers a solution which provides a reliable communication. It enables the transmission of signals over long distances, connecting remote areas to the rest of the network.

4. The demand for wider channels for radio backhaul will continue to grow as TSPs rollout next generation technologies or migrate the systems to new efficient networks.

5. The requirement of Microwave carriers is critical to rollout newer technologies and hence should be treated as an essential resource. It is a complementary facility for enabling the expeditious rollout of networks using the RF spectrum.

6. The new data rich services will place additional demands on the access network and backhaul spectrum which may become the constraining factor in high speed data-rate modern communications systems, if its allocation and pricing issues are not addressed.

7. The mobile broadband services especially through the next generation wireless networks will require quantum increase in the capacity of mobile backhaul network. The data carrying capacity of access technologies can be effective only if these are complemented by equally supportive and capable backhaul networks.

8. The main driving factors for backhaul spectrum should be industry's financial health, expansion/deployment of 5G networks and securing investments in networks.

9. To cater to the consumption levels of 4G and 5G services, the backhaul has to either move to fiber or to a dedicated high-bandwidth spectrum band. As fiberization would take time, the backhaul spectrum bands including E-band, V-band, Traditional microwave backhaul bands or MWA and MWB would gain more prominence and would be highly useful.

B. <u>Demand of Spectrum in Traditional microwave radio backhaul bands</u>

1. The demand for backhaul will significantly grow with the uptake of 5G services as well as deployment of new use-cases or high-quality content which will require higher amount of access and backhaul capacities.

2. Any decision on spectrum, which is in natural evolution of IMT services, should not be influenced or limited with information on likely demand only in short term. Adequate supply of spectrum for IMT services is the key for digital growth of the country.

3. Kindly find below in Table-1 the likely demand for quantum of spectrum required in traditional Microwave radio backhaul bands. The likely demand is based on present assumptions and can't be provided with a higher certainty.

4. The most important factor in determining this demand is the present pricing of the radio backhaul spectrum. Given the high % of AGR with increasing increments being applied for

additional carriers, the demand is skewed towards minimum possible carriers required and would not be helpful for consumers to have optimal experience.

Table-1

Short-Term

Band	Quantum of spectrum required (per entity per LSA)
	TSPs with Access Service License/ Authorization
6 GHz (5.925-6.425 GHz)	
7 GHz (7.125-7.425 GHz)	
7 GHz (7.425-7.725 GHz)	1
13 GHz (12.750-13.250 GHz)	
15 GHz (14.5-15.5 GHz)	5
18 GHz (17.7-19.7 GHz)	2
21 GHz (21.2-23.6 GHz)	1

Long-Term

Band	Quantum of spectrum required (per entity per LSA)
	TSPs with Access Service License/ Authorization
6 GHz (5.925-6.425 GHz)	
7 GHz (7.125-7.425 GHz)	
7 GHz (7.425-7.725 GHz)	2
13 GHz (12.750-13.250 GHz)	
15 GHz (14.5-15.5 GHz)	5
18 GHz (17.7-19.7 GHz)	2
21 GHz (21.2-23.6 GHz)	1

5. Given the critical need of radio backhaul spectrum, its prices need rationalization which will help realize its true potential within telecom operator's network and for providing enriched experience to the consumers.

Q2. 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.

VIL Comments to Q. No. 2

1. As per the Telecommunication Act 2023, meaning of radio backhaul has been prescribed as:

> *The term "radio backhaul" shall mean the use of radio frequency only to interconnect telecommunication equipment, other than the customer equipment in telecommunication networks.*

2. As is clear from the above extract, the radio backhaul is used to interconnect telecommunication equipment, and it has nothing to do with what commercial telecommunication services are being given to the consumers.

3. Even from deployment and technology perspective, the radio backhaul over traditional microwave backhaul bands has been deployed over the years to serve all commercial IMT services, be it 2G, 3G, 4G or 5G. This should be best left to the access service providers, to decide which commercial telecommunication traffic is to be backhauled through the traditional microwave backhaul bands.

4. Also, given the importance of spectrum from traditional microwave backhaul bands for the access mobile services in the country, it should be kept exclusively for radio backhaul for access authorisation holders only. No spectrum from these bands should be allowed for other authorisation holders like NLD or ISP. These licensees generally take managed services from each other.

5. Further, already there is substantial spectrum available in unlicensed bands and additional spectrum is being envisaged to be unlicensed in lower 6 GHz as well. The stakeholders other than wireless service providers can very well utilize the unlicensed bands and serve their requirements instead of fragmenting the spectrum to be used by wireless access service providers.

6. Also, the TRAI has envisaged pan-India unified license also and in long-term, such pan-India license will lead to minimal use case left for NLD players. Hence, there is no need to fragment the spectrum in traditional microwave radio backhaul bands for assigning them to NLD/ISP players.

7. **Therefore, we strongly recommend that the existing meaning prescribed in the Telecommunication Act 2023 is sufficient i.e. backhaul is meant only to interconnect telecommunication equipment other than customer equipment. The access service provider should continue to have the flexibility of choosing which commercial telecommunication services are to be backhauled through the use of traditional microwave backhaul bands, and nothing should be fixed by Licensor/Regulator. Further, the traditional microwave backhaul bands should only be allocated to access service authorisation holders only.**

Q3. 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 the relevant commercial telecommunication services.

And

Q4. In case it is decided to use different methods (block-based, linkbased, 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.

VIL Comments to Q. No. 3 and 4

1. **Spectrum assignment on block-basis only i.e. for entire LSA**

   a. It is important to maintain robustness, certainty and uniformity in spectrum assignment and pricing methodologies. Spectrum being one of the major cost-element of telecom networks, any deviation from uniform policies, can disturb level playing field and provide benefit to certain entities at the cost of others.

   b. The present link-wise allocation of MWB spectrum is technically inefficient and at the same time, the charges are required to be paid based on AGR for entire LSA. The carrier in MWB is used substantially within the LSA across different geographical areas hence, the need of taking point-wise allocation is against the spirit of ease of doing business. This anomaly requires to be addressed and corrected.

   c. The present access licensing and spectrum assignment framework is LSA based hence, the network designing, planning and deployments are on LSA level only. TSP may require different quantity of channels in different LSAs depending upon their stage of their deployments, traffic etc. Any depart from LSA based framework, is expected to bring inefficiencies as well as non-level playing field.

   d. **Therefore, we strongly urge that the spectrum in all traditional microwave backhaul bands (all the spectrum bands irrespective of MWA or MWB), should be allocated on block-basis for entire LSA, for radio backhaul purposes.**

Q5. 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.

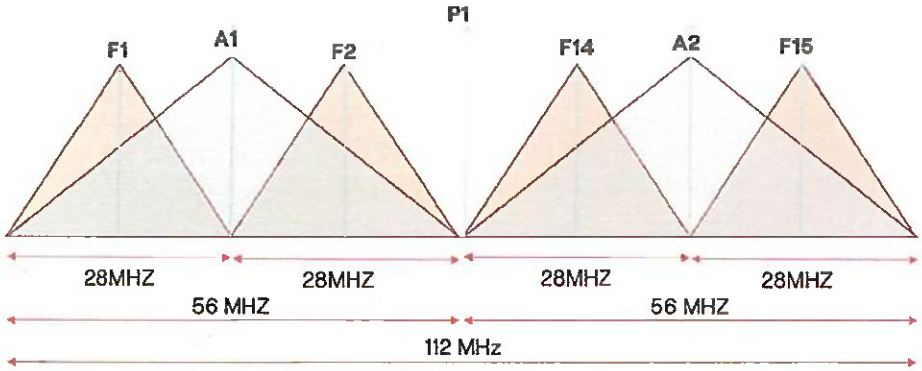
VIL Comments to Q. No. 5

1. **Carrier Size:** The carrier size **should be 28 MHz (paired spectrum)** for spectrum in all the traditional microwave backhaul bands, with possibility to use multiple adjacent channels forming higher channel bandwidth per carrier.

2. **Carrier Aggregation:**

   a. Carriers of 56 MHz (Paired) and 112 MHz (paired) should be allowed to use and counted as 2 and 4 carries respectively. When operator has such adjacent carriers, it should be explicitly clarified that there is no separate permission required from DoT for its use as either 56 MHz or 112 MHz or any combination which falls under assigned spectrum range. In this regard, kindly refer below sample illustration.

Illustration-1: Channel BW and its usage (Sample for 15 GHz)



15 Ghz (28Mhz) Centre Freq.			15 Ghz (56Mhz) Centre Freq.			15 Ghz (112Mhz) Centre Freq.		
Spot	Low	High	Spot	Low	High	Spot	Low	High
F1	14515	14935	A1	14529	14949	P1	14557	14977
F2	14543	14964						
F3	14879	15299	A2	14893	15313			
F4	14907	15327						

When an operator is having four spots of 28 MHz each (F1, F2, F3 and F4) it should be possible to use them as two carriers of 56 MHz each (A1, A2) as well as single carrier of 112 MHz (P1) without any special permission from DoT.

   b. **Therefore, carrier aggregation should be explicitly allowed without any need for intimation or approval from DoT.** Further, harmonization should also be carried out to enable carrier aggregation, wherever technically possible without causing financial impact to any stakeholder.

3. **Validity Period and Renewal Mechanism:**

   a. The radio backhaul spectrum plays a very critical part within a network, for providing wireless access services. Also, the prevalent provisions of the Telecommunication Act 2023 prescribe assignment of radio backhaul spectrum on administrative basis.

   b. Further, there would be certain charges (presently on AGR based) which have to be paid for this spectrum hence, there is no requirement for putting any validity period or any renewal mechanism.

   c. With this, we recommend that the validity of traditional microwave radio backhaul spectrum should continue to be valid till an access service provider is providing wireless access services, in a given service area. There should not be any need to seek its renewal at any point in time.

4. **Roll-out obligations:**

   a. Roll out obligations are provided for ensuring that the spectrum is deployed and consumers can utilize the services.

   b. However, in the case of radio backhaul spectrum, firstly the spectrum is not used for connecting customer end terminals and secondly, price is being paid for the spectrum.

   c. Therefore, no roll-out obligations should be prescribed for radio backhaul spectrum.

5. **Surrender of Spectrum:**

   a. With evolvement of technologies, capacity requirements, new bands being introduced, fiberization, the cellular networks have to keep on optimizing backhaul infrastructure including the spectrum bands and quantum.

   b. Spectrum surrender allows TSPs to have freedom and encourage them to keep on optimizing the backhaul infrastructure as well as to adopt more efficient technologies and spectrum bands.

   c. Further, technology shift on radio backhaul spectrum could be more dynamic than for access spectrum as such, the spectrum surrender should continue to be allowed.

   d. DoT had issued surrender guidelines for Backhaul spectrum vide its office memorandum no. L-14042/01/2022-IMT, dated 10.11.2022, which contains associated terms for the said surrender.

e. **These guidelines and process of radio backhaul spectrum surrender should continue and there should not be any mandatory notice period or lock-in period, before surrender of spectrum.**

Q6. 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.

And

Q7. 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.

VIL Comments to Q. No. 6 and 7

1. **There should be no ceiling on the** maximum numbers of carriers in MWA (13/15/18/21 GHz bands) and in MWB (6/7 GHz bands) spectrum bands, subject to the existing holdings of TSPs being protected.

2. In this way, a TSP will be empowered to voluntarily get their radio backhaul holdings harmonized in one of the spectrum band across the LSA and country, which will enable equipment synergy across the board.

3. With said harmonization, carrier aggregation will be possible and easier with 'n' number of contiguous 28MHz spots into one channel and help achieve higher capacities and optimum utilisation of radio backhaul spectrum, which will certainly be required with increase in data demand / consumption with the addition / advent of new technologies.

Q8. 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.

VIL Comments to Q. No. 8

1. Indian telecom networks have evolved over the period of time basis administratively assigned MWA-MWB spectrum and there are multiple OEM and equipment deployed in the administratively assigned frequencies.

2. Equipment deployed in existing network does not support the entire range of frequencies available in a particular band. Hence, **allocation of different frequencies even in the same band would lead to two huge issues:**

    a. **Heavy disruption in services and**

    b. **Huge capex requirements and sunk costs of existing equipment.**

3. Also, if the TSP is unable to get the frequencies in the same band as being deployed presently (e.g. 15 GHz), it would cause humungous change in network design and planning, service disruption and capex requirements, because, with change in band there would also be change in propagation characteristics of different bands besides equipment not being compatible. Such huge changes are technically not recommended for evolved and stable networks as are available in India and must be avoided at all costs.

4. **Therefore, existing holdings of traditional microwave backhaul bands with wireless access service providers have to be protected else it would cause catastrophic effects on the telecom networks, disruption of existing services to subscribers for a prolonged period as well as financial impact to TSPs.**

Q9. 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 WRC-27, 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.

And

Q10. 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.

VIL Comments to Q. No. 9 and 10

1. **7125-8400 MHz (7 GHz band):**

   a. The review of 7 GHz can be carried out in couple of years. Principally, in so far existing holdings in 7 GHz bands being used for radio backhaul are protected, we do not foresee any issue in allocation of non-overlapping channels for Access utilisation (IMT).

   b. For review, there should be a clear long-term roadmap and unutilized spots can be considered for utilizing for IMT services. For spots currently being utilized, a review can be carried out after few years (let' say 3-5 years).

   c. There should be some guard band to address issues of interference between access and backhaul uses.

2. **14.8-15.35 GHz (15 GHz):**

   a. This is the primary band available and being used for radio backhaul within the traditional microwave backhaul bands. VIL has major holdings in this bands and has been deployed for major part of the radio backhaul network i.e. ~80% of all radio backhaul hops. The equipment deployed for this radio backhaul is frequency spots specific and cannot be used for any other frequency spots (neither within the same band nor in other bands) and would thus, be rendered waste if a TSP is not able to get back the same frequency spots.

   b. Clearly for 15 GHz band, the existing holdings being utilized by the TSPs including VIL as well as unutilized spots, should be protected and should continue to be used for radio backhaul only.

   c. **Therefore, allocation of 15 GHz band for access purposes should be avoided at all costs. If TSPs existing holdings in 15 GHz are not protected, it would lead to catastrophic effects on the telecom networks, disruption of existing services to subscribers for a prolonged period as well as financial impact to TSPs.**

Q11. 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.

And

Q12. 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.

VIL Comments to Q. No. 11 and 12

1. The spectrum so far has been technology neutral and should continue to be. Earmarking any spectrum for a specific technology or service (like FWA) would be highly inefficient and disturb the level playing field.

2. Also, there are many access licensed bands as well as unlicensed bands, which can help address last mile challenges like large frequency blocks in mmWave spectrum with existing TSPs or existing unlicensed band and upcoming unlicensed band in lower 6 GHz.

3. **Therefore, no quantum of spectrum in traditional microwave backhaul bands should be earmarked for last mile connectivity (Fixed Wireless Access).**

Q13. Should a certain quantum of the spectrum in traditional microwave backhaul bands be earmarked for fulfilling point-to- point connectivity requirements of captive (noncommercial/ 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.

And

Q14. In case your response to Q13 is 'no', in what manner should the point-to-point connectivity requirements of captive (noncommercial/ non-TSP) users be fulfilled? Kindly provide a detailed response with justifications.

And

Q15. 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.

VIL Comments to Q. No. 13, 14 and 15

1. Given the importance of radio backhaul to access telecom networks, no quantum of spectrum should be removed from the traditional microwave radio backhaul bands for earmarking for the point-to-point connectivity requirements of captive (non-commercial/non-TSP) users.

2. The radio backhaul spectrum should be provided only on block basis (i.e. for entire LSA) to access operators and no point-to-point link basis approach be followed.

3. In our view, allocation spectrum as service specific will create fragmentation issues, arbitrage as well as complicate pricing. The consultation paper also doesn't provide any detailed opportunity cost and value analysis, which is crucial to be carried out before fragmenting spectrum.

4. It is important to note that there is substantial unlicensed band available and can help serve the demand of such captive (non-commercial/non-TSP) users. Besides, Government is also looking at providing more unlicensed spectrum in lower 6 GHz band.

5. **Therefore, we recommend that there should not be any direct spectrum earmarking or allocation to non-commercial/non-TSP users.**

6. In addition to the existing and upcoming unlicensed band, the demand of captive (non-commercial/non-TSP) users can also be met through spectrum leasing by access providers. For this, the policy framework should allow spectrum leasing by access service provider on P2P links basis. It is important to recognize that regulated structures (in this case administrative assignments on P2P links basis) should be resorted to, only if the

market is not able to fulfill the demand of such captive (non-commercial/non-TSP) users and there is market failure for a reasonable period of time and it is not possible to course-correct such market failure through any other means/measures. The TRAI and DoT can review the market after few years, if there is demand of captive (non-commercial/non-TSP) users and if it is not met through spectrum leasing option provided to Access service providers.

7. **Therefore, the Authority can look into recommending a framework allowing sharing option through spectrum leasing on P2P links or geography basis.**

Q16. 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.

VIL Comments to Q. No. 16

Since the measures required will depend on the usage and specific nature and the sensitivity of the equipment deployed the band in question and concerned user will be best positioned to comment and recommend the measures required for safeguarding the use case, hence we recommend that a committee should be formed which should also include the TSPs and other relevant stakeholders, to study the impact of delicensing on the existing users of this band.

Q17. 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.

VIL Comments to Q. No. 17

No comments.

Q18. 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 technical standards and eco-system.

And

Q19. 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 technical standards and eco-system.

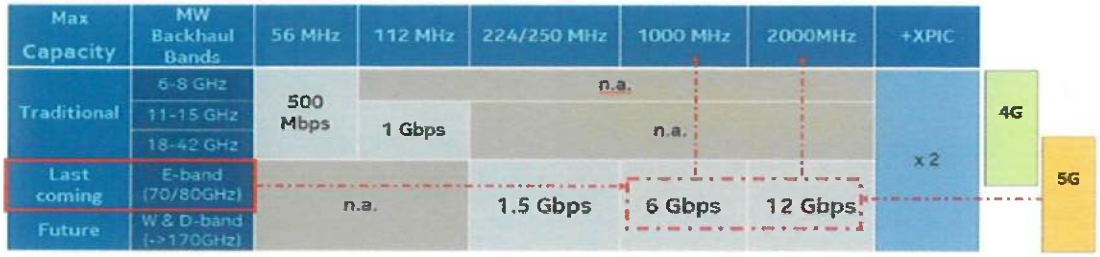
VIL Comments to Q. No. 18 and 19

1. **Backhaul**

   a. The requirement of E-band and V-band carriers is critical to rollout newer technologies and hence should be treated as an essential resource. To cater to the consumption levels of present 4G and 5G services as well as upcoming 6G services, the backhaul has to either move to fiber or to a dedicated high-bandwidth spectrum band. As fiberization would take time, the backhaul spectrum bands including E-band, V-band, MWA and MWB would gain prominence and would be highly useful.

   b. **Data growth:** Considering technology evolution and expansion, data growth expected is given in illustration below:

4G and 5G requirements vs Spectrum bands and channel size



   c. **Demand in E-Band:**

      i. **In short-term (4 to 8 quarters):** 3 x 250 MHz per Access service Authorisation holder per LSA.

      ii. **In long-term (10 to 20 quarters):** 4 x 250 MHz per Access service Authorisation holder per LSA.

      iii. However, it is expected that demand for E-band is going to reach to 4 x 250 MHz in medium term only given the huge growth in data consumption.

   d. **Demand in V-Band:**

      i. **In short-term (4 to 12 quarters):** 5 x 50 MHz per Access service Authorisation holder per LSA.

ii. **In long-term (10 to 20 quarters):** 10 x 50 MHz per Access service Authorisation holder per LSA.

iii. However, it is expected that demand for V-band is going to reach to 10 x 50 MHz in medium term only, given the huge growth in data consumption.

2. **Access and Integrated Access Backhaul (IAB):**

a. While 5G and upcoming access technologies provide wireless broadband experience to end users with huge data quantum consumption, backhaul of such huge data is a challenge in today's era. E band and V Band is a ray of hope to enable faster and meaningful rollout of 5G connectivity.

b. Since there is a very limited spectrum available in E/V band spectrum, sharing it for Access or IAB will further lead to reduction of spectrum for Backhaul purposes and subsequently, will limit effective utilisation of acquired Access spectrum with congested backhauls.

c. Besides, there is ample spectrum available for access including mmWave spectrum which was bought during last auction. TSPs have not been able to garner much deployments and use-cases in mmWave spectrum presently. As such, it is advised to refrain from utilizing E-band for access/IAB purposes, preserving its current value as well as avoiding potential pricing complications.

d. The argument of bringing access aspect into E-band and V-band utilisation is indirectly meant to bypass provisions of The Telecommunications Act, 2023 ('Act') which allows radio backhaul to be provided through administrative assignments. If E-band and V-band is considered for both access as well as backhaul, it would inflate its valuation manifold. This will make the adequate number of carriers for backhaul purposes, beyond a reasonable financial level thereby, hurting 5G deployments/expansions and would end up benefitting only the deep pocketed players. It will defeat the very objective of the provisions of Act providing radio backhaul on administrative basis.

e. Currently as per DoT's allocation norms, there is clear bifurcation of Access and Backhaul spectrum which is working absolutely fine and hence, this framework should continue going forward as well.

f. Further, global evidence of deployments also shows that E-band/V-band is used for backhaul purposes only. The global deployments indicate that IAB has not got any encouraging adoption and equipment availability is also limited.

g. **Therefore, VIL strongly recommends that E-band and V-band which provide an evolved and reliable backhaul solution, should be designated exclusively for radio backhaul of Wireless Access technologies (e.g. 5G, 4G, 2G and upcoming 6G).**

Q20. 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.

VIL Comments to Q. No. 20

1. As per the Telecommunication Act 2023, meaning of radio backhaul has been prescribed as:

   The term "radio backhaul" shall mean the use of radio frequency only to interconnect telecommunication equipment, other than the customer equipment in telecommunication networks.

2. As is clear from the above extract, the radio backhaul is used to interconnect telecommunication equipment, and it has nothing to do with what commercial telecommunication services are being given to the consumers.

3. Even from deployment and technology perspective, the radio backhaul over traditional microwave backhaul bands and E-band has been deployed over the years to serve all commercial IMT services, be it 2G, 3G, 4G or 5G. This should be best left to the access service providers, to decide which commercial telecommunication traffic is to be backhauled through the traditional microwave backhaul bands.

4. Also, given the importance of spectrum from traditional microwave backhaul bands for the access mobile services in the country, it should be kept exclusively for radio backhaul for wireless access authorisation holders only. No spectrum from these bands should be allowed for other authorisation holders like NLD or ISP. These licensees generally also take managed services.

5. Further, already there is substantial spectrum available in unlicensed bands and additional spectrum is being envisaged to be unlicensed in lower 6 GHz as well. The stakeholders other than wireless access service providers can very well utilize the unlicensed bands and serve their requirements instead of fragmenting the spectrum to be used by wireless access service providers.

6. Also, the TRAI has envisaged and recommended pan-India unified license also and in long-term, such pan-India license will lead to minimal use case left for NLD players. Hence, there is no need to fragment the spectrum in E/V bands for assigning them to NLD/ISP players.

7. **Therefore, we strongly recommend that the existing meaning prescribed in the Telecommunication Act 2023 is sufficient i.e. backhaul is meant only to interconnect telecommunication equipment other than customer equipment. The wireless access**

service provider should continue to have the flexibility of choosing which commercial wireless telecommunication services are to be backhauled through the use of E/V bands, and nothing should be fixed by Licensor/Regulator. Further, the E/V should only be allocated to access service authorisation holders only and not to NLD/ISP authorisation holders.

Q21. 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.

And

Q22. 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.

VIL Comments to Q. No. 21 and 22

1. **Spectrum assignment on block-basis only i.e. for entire LSA:**

   a. It is important to maintain robustness, certainty and uniformity in spectrum assignment and pricing methodologies. Spectrum being one of the major cost-element of telecom networks, any deviation from uniform policies, can disturb level playing field and provide benefit to certain entities at the cost of others.

   b. The present link-wise allocation of MWB spectrum shows that it is technically inefficient and at the same time, the charges are required to be paid based on AGR for entire LSA. The carrier in MWB is used substantially within the LSA across different geographical areas hence, the need of taking point-wise allocation is against the spirit of ease of doing business. While this anomaly requires to be addressed and corrected for MWB spectrum, it cannot be allowed to creep into the evolved spectrum of E/V band having technologically advanced utility.

   c. Most importantly, the present access licensing and spectrum assignment framework is LSA based hence, the network designing, planning and deployments are on LSA level only. A TSP may require different quantity of channels in different LSAs depending

upon their stage of their deployments, traffic etc. However, any depart from LSA based framework, is expected to bring inefficiencies as well as non-level playing field.

d. **Therefore, we strongly urge that the spectrum in E/V bands should be allocated only on block-basis for entire LSA, for radio backhaul purposes.** The frequencies in these bands are having short distance propagation characteristics leading to its dense usage hence, allocation has to be done on a block basis only. Moreover, interference management on a point to point link basis, will be operationally a nightmare.

Q23. 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.

VIL Comments to Q. No. 23

1. **Band plan:** E Band (71 to 76 GHz & 81 to 86 GHz)

2. **Carrier Size:**

   a. The basic channel size of higher frequency bands is larger, allowing to higher transport capacity required for 5G.

   b. **E-Band should have channel size of 250 MHz (paired spectrum) for administrative assignment purposes.**

   c. **Also, the use of channel size should not be mandated and operators should be allowed to make the strategy as per Radio spectrum availability, their backhaul requirement and Fiber penetration in respective LSA.** This means that each Carrier equivalent to 250 MHz paired spectrum should have flexibility of usage in split (i.e. 62.5 / 125MHz per link) or in aggregated (i.e. 500 / 750 / 1000MHz per link), without any additional restriction/disincentives or approvals/intimation required.

3. **Carrier aggregation:**

a. Larger channel size allows higher backhaul throughput and more efficient use of available power and multiplexing schemes. Majority of the OEMs in E Band supports channel size upto 2000 MHz.

b. **The Carrier aggregation should have flexibility and be allowed in multiples of 250 MHz and upto 1000 MHz (paired). When operator has such adjacent carriers, it should be explicitly clarified that there is no separate permission (or information) required from DoT for its use as either 500 MHz or 1000 MHz or any combination which falls under assigned spectrum range.**

c. **Therefore, carrier aggregation should be explicitly allowed without any need for intimation or approval from DoT.** Further, harmonization should also be carried out to enable carrier aggregation, wherever technically possible without causing financial impact to any stakeholder.

4. **Validity period of the assignment:**

a. The radio backhaul spectrum plays a very critical part within a network, for providing wireless access services. Also, the prevalent provisions of the Telecommunication Act 2023 prescribe assignment of radio backhaul spectrum on administrative basis.

b. Further, there would be certain charges (presently on AGR based) which have to be paid for this spectrum hence, there is no requirement for putting any validity period.

c. **With this, we recommend that the validity of radio backhaul spectrum should continue to be valid till an access service provider is providing wireless access services in a given service area.**

5. **Renewal mechanism:**

a. In continuation of the above, since, there would be certain charges (presently on AGR based) which have to be paid for this spectrum hence, there is no requirement of any renewal mechanism.

b. There should not be any need to seek its renewal at any point in time.

6. **Surrender of the spectrum:**

a. With evolvement of technologies, capacity requirements, new bands being introduced, fiberization etc., the cellular networks have to keep on optimising backhaul infrastructure including the spectrum bands and quantum.

b. Spectrum surrender allows TSPs to have freedom and encourage them to keep on optimising the backhaul infrastructure as well as to adopt more efficient technologies and spectrum bands.

c. Further, technology shift on radio backhaul spectrum could be more dynamic than for access spectrum as such, the spectrum surrender should continue to be allowed.

d. DoT has issued surrender guidelines for Backhaul spectrum vide its office memorandum no. L-14042/01/2022-IMT, dated 10.11.2022, which contains associated terms for the said surrender. **These guidelines and process of radio backhaul spectrum surrender should continue and there should not be any mandatory notice period or lock-in period, before surrender of spectrum.**

7. **Ceiling on the number of carriers (spectrum cap):**

a. In case of limited spectrum availability, ceilings become crucial part of spectrum policies as it provides a pillar to support adequate competition and competitive players in the market, which in this case would be at least 4 TSPs (3 private + 1 PSU). Unlike traditional microwave backhaul bands, both E-band and V-band has limited spectrum availability and hence, it is important to have ceiling to ensure equitable availability for all stakeholders.

b. E-band and V-band have different commercial value and ecosystem. In such case, their appeal to the TSPs will be different and will depend upon various dynamic factors. To avoid monopolization of spectrum within either of these bands, it is imperative that there should be a ceiling for each of the spectrum band i.e. separate for E-band and V-band.

c. E-Band has 19 carriers of 250 MHz paired spectrum available. It is estimated that 4 such carriers would be crucial for a TSP to meet the 5G demand in next few years.

d. **Therefore, a ceiling of 4 E-band Carriers/TSP (of 250 MHz paired spectrum) should be prescribed.**

8. **Criteria for the assignment of additional spectrum above the ceiling limit:**

a. **In case of E-band, there should not be any allocations beyond ceilings** as it defeats the robustness of the terms and conditions, brings in non-transparency and defeats certainty in regulatory norms.

b. At the first stage itself, any justification for allocation beyond ceiling should be used to review the level of ceilings. Even in future, if there is any justification for allocation beyond ceiling, same should be made part of periodic review through comprehensive consultation process.

9. **Roll-out obligations:**

a. Roll out obligations are provided for ensuring that the spectrum is deployed and consumers can utilize the services.

b. However, in the case of radio backhaul spectrum the spectrum is not used for connecting customer end terminals.

c. **Therefore, no roll-out obligations should be prescribed for radio backhaul spectrum as it is not a consumer serving spectrum.**

Q24. 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.

VIL Comments to Q. No. 24

1. While 51q7-64 GHz appears to be good enough for radio backhaul purposes however, it would not be a good approach to waste spectrum in between 64 GHz and 66 GHz.

2. The equipment from OEMs also support the spectrum from 57-66 GHz.

3. As such, the spectrum till 66 GHz should be considered for radio backhaul purposes considering future requirements and uncertain developments.

4. **Guard Band between Backhaul and Access Use:**

   a. Regarding guard band there are no specific guidelines as defined in V-band for co-existence with different technologies. But, based on studies, a guard band of 100-200 MHz is often considered sufficient to provide adequate protection against interference in the V-band.

   b. While 100-200 MHz is a common range, the specific size of the guard band can vary depending on factors such as the specific technologies used, the density of deployments, and the regulatory requirements of a particular region or country.

   c. **Considering above points, we recommend to keep guard band of at least 100 MHz both ends of spectrum decided to be used for Backhaul.**

Q25. 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.

VIL Comments to Q. No. 25

1. **Band plan:** V Band (57 GHz to 66 GHz)

2. **Carrier Size:**

   a. The basic channel size of higher frequency bands is larger, allowing to higher transport capacity required for 5G.

   b. V-Band should have channel size of 50 MHz-TDD for administrative assignment purposes.

   c. **Also, the use of channel size should not be mandated and operators should be allowed to make the strategy as per Radio spectrum availability, their backhaul requirement and Fiber penetration in respective LSA.** This means that each Carrier equivalent to 50 MHz spectrum should have flexibility of usage in split (i.e. 12.5/25 MHz per link) or in aggregated (i.e. 100 / 150 / 500 MHz per link), without any additional restriction/disincentives or approvals/intimation required.

3. **Carrier aggregation:**

   a. Larger channel size allows higher backhaul throughput and more efficient use of available power and multiplexing schemes. Majority of the OEMs in V Band supports channel size upto 500 MHz.

   b. **The Carrier aggregation should have flexibility and be allowed in multiples of 50 MHz and upto 500 MHz. When operator has such adjacent carriers, it should be explicitly clarified that there is no separate permission (or information) required from DoT for its use as either 100 MHz or 500 MHz or any combination which falls under assigned spectrum range.**

   c. **Therefore, carrier aggregation should be explicitly allowed without any need for intimation or approval from DoT.** Further, harmonization should also be carried out

to enable carrier aggregation, wherever technically possible without causing financial impact to any stakeholder.

4. **Validity period of the assignment:**

   a. The radio backhaul spectrum plays a very critical part within a network, for providing wireless access services. Also, the prevalent provisions of the Telecommunication Act 2023 prescribe assignment of radio backhaul spectrum on administrative basis.

   b. Further, there would be certain charges (presently on AGR based) which have to be paid for this spectrum hence, there is no requirement for putting any validity period.

   c. **With this, we recommend that the validity of radio backhaul spectrum should continue to be valid till an access service provider is providing wireless access services in a given service area.**

5. **Renewal mechanism:**

   a. In continuation of the above, since, there would be certain charges (presently on AGR based) which have to be paid for this spectrum hence, there is no requirement of any renewal mechanism.

   b. There should not be any need to seek its renewal at any point in time.

6. **Surrender of the spectrum:**

   a. With evolvement of technologies, capacity requirements, new bands being introduced, fiberization etc., the cellular networks have to keep on optimising backhaul infrastructure including the spectrum bands and quantum.

   b. Spectrum surrender allows TSPs to have freedom and encourage them to keep on optimising the backhaul infrastructure as well as to adopt more efficient technologies and spectrum bands.

   c. Further, technology shift on radio backhaul spectrum could be more dynamic than for access spectrum as such, the spectrum surrender should continue to be allowed.

   d. DoT has issued surrender guidelines for Backhaul spectrum vide its office memorandum no. L-14042/01/2022-IMT, dated 10.11.2022, which contains associated terms for the said surrender. **These guidelines and process of radio backhaul spectrum surrender should continue and there should not be any mandatory notice period or lock-in period, before surrender of spectrum.**

7. **Ceiling on the number of carriers (spectrum cap):**

a. In case of limited spectrum availability, ceilings become crucial part of spectrum policies as it provides a pillar to support adequate competition and competitive players in the market, which in this case would be at least 4 TSPs (3 private + 1 PSU). Unlike traditional microwave backhaul bands, both E-band and V-band has limited spectrum availability and hence, it is important to have ceiling to ensure equitable availability for all stakeholders.

b. E-band and V-band have different commercial value and ecosystem. In such case, their appeal to the TSPs will be different and will depend upon various dynamic factors. **To avoid monopolization of spectrum within either of these bands, it is imperative that there should be a ceiling for each of the spectrum band i.e. separate for E-band and V-band.**

c. V-Band has 138 carriers of 50 MHz TDD spectrum available. It is estimated that 10 such carriers would be required to meet the 5G demand in next few years.

d. **Therefore, a ceiling of 10 V-band Carriers/TSP (of 50 MHz-TDD spectrum) should be prescribed.**

8. **Criteria for the assignment of additional spectrum above the ceiling limit:**

a. **There should not be any allocations beyond ceilings** as it defeats the robustness of the terms and conditions, brings in non-transparency and defeats certainty in regulatory norms.

b. At the first stage itself, any justification for allocation beyond ceiling should be used to review the level of ceilings. Even in future, if there is any justification for allocation beyond ceiling, same should be made part of periodic review through comprehensive consultation process.

9. **Roll-out obligations:**

a. Roll out obligations are provided for ensuring that the spectrum is deployed and consumers can utilize the services.

b. However, in the case of radio backhaul spectrum the spectrum is not used for connecting customer end terminals.

c. Therefore, no roll-out obligations should be prescribed for radio backhaul spectrum as it is not a consumer serving spectrum.

Q26. In case it is decided to earmark a few carriers in E-band and/or V-band 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.

VIL Comments to Q. No. 26

1. While 5G and upcoming access technologies provide wireless broadband experience to end users with huge data quantum consumption, backhaul of such huge data is a challenge in today's era. E band and V Band is a ray of hope to enable faster and meaningful rollout of 5G connectivity.

2. Since there is a very limited spectrum available in E/V band spectrum, sharing it for Access/IAB will further lead to reduction of spectrum for Backhaul purposes and subsequently, will limit effective utilisation of acquired Access spectrum with congested backhauls.

3. Besides, there is ample spectrum available for access including mmWave spectrum which was bought during last auction. TSPs have not been able to garner much deployments and use-cases in mmWave spectrum presently. As such, it is advised to refrain from utilizing E-band for access purposes, preserving its current value as well as avoiding potential pricing complications.

4. The argument of bringing access aspect into E-band and V-band utilisation is indirectly meant to bypass provisions of The Telecommunications Act, 2023 ('Act') which allows radio backhaul to be provided through administrative assignments. If E-band and V-band is considered for both access as well as backhaul, it would inflate its valuation manifold. This will make the adequate number of carriers for backhaul purposes, beyond a reasonable financial level thereby, hurting 5G deployments/expansions and would end up benefitting only the deep pocketed players. It will defeat the very objective of the provisions of Act providing radio backhaul on administrative basis.

5. Currently as per DoT norms, there is clear bifurcation of Access and Backhaul spectrum which is working absolutely fine and hence, this framework should continue going forward as well.

6. Further, global evidence of deployments also shows that E-band/V-band is used for backhaul purposes only. Also, global deployments indicate that IAB has not got any encouraging adoption and equipment availability is also limited.

7. **Therefore, VIL strongly recommends that E-band and V-band which provide an evolved and reliable backhaul solution, should be designated exclusively for backhaul of wireless Access technologies (for example 5G, 4G, 2G and upcoming 6G).**

Q27. 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.

And

Q28. In case your response to Q27 is 'no', in what manner should the point-to-point connectivity requirements of captive (noncommercial/ non-TSP) users be fulfilled? Kindly provide a detailed response with justifications.

VIL Comments to Q. No. 27 and 28

1. Given the importance of radio backhaul to access telecom networks, no quantum of spectrum should be removed from the evolved E/V bands for earmarking for the point-to-point connectivity requirements of captive (non-commercial/non-TSP) users.

2. The radio backhaul spectrum should be provided only on block basis (i.e. for entire LSA) to access operators and no point-to-point link basis approach be followed.

3. In our view, allocation spectrum as service specific will create fragmentation issues. The consultation paper also doesn't provide any detailed opportunity cost and value analysis, which is crucial to be carried out before fragmenting spectrum.

4. It is important to note that there is substantial unlicensed band available and can help serve the demand of such captive (non-commercial/non-TSP) users. Besides, Government is also looking at providing more unlicensed spectrum in lower 6 GHz band.

5. **Therefore, we recommend that there should not be any direct spectrum allocation or earmarking for non-commercial/non-TSP users.**

6. In addition to the existing and upcoming unlicensed band, the demand of captive (non-commercial/non-TSP) users can be met through spectrum leasing by access providers. For this, the policy framework should allow spectrum leasing by access service provider on P2P links basis. It is important to recognize that regulated structures (in this case administrative assignments on P2P links basis) should be resorted to, only if the market is not able to fulfill the demand of such captive (non-commercial/non-TSP) users and there is market failure for a reasonable period of time and it is not possible to course-correct such market failure through any other means/measures. The TRAI and DoT can review the market after few years, if there is demand of captive (non-commercial/non-TSP) users and if it is not met through spectrum leasing option provided to Access service providers.

7. **Therefore, the Authority can look into recommending a framework allowing sharing option through spectrum leasing on P2P links or geography basis.**

Q29. 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.

And

Q30. In case it is decided to allow low power indoor consumer device-to-device usages on a license-exempt basis in the Vband (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 aportion 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 technical 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.

And

Q31. Whether there is a need for permitting "outdoor" usages of Vband on a license-exempt basis? Kindly provide a detailed response with justification and international scenario.

And

Q32. 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.

And

Q33. 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 technical 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.

VIL Comments to Q. No. 29, 30, 31, 32 and 33

1. Such feasibilities should not be assessed on paper or through any research/study conducted in some other countries. Such feasibilities should be assessed through proper research/studies within the country else interference can be a major challenge. Controlling EIRP maybe next to possible. Even in case, any mechanism or means is found to control EIRP, the same will have to be discussed between all relevant stakeholders.

2. Therefore, we recommend that interference should be examined in detail through a study before deciding on delicensing for indoor usage.

3. Before deliberation on delicensing or license exempt, it is imperative for TRAI to seek Report from DoT containing Utilization audit of present delicensed spectrum, demand studies for new frequency range and interested parties, use cases etc. In our view, there are no compelling use-cases for standalone indoor use of V band.

4. Already lower 6 GHz is being looked for delicensed purposes. There is no case for additional spectrum to be delicensed.

5. Keeping this in view, we recommend that:

a. **No spectrum in V-band should be considered for any standalone low-powered indoor use.**

b. A progressive guideline has already been issued by Government through DoT's circular dated 23.07.2019, which provide ample opportunities for research and development. For any other commercial purposes, the spectrum should be obtained through a fair and transparent auction, by paying market determined price. **Therefore, no spectrum should be considered for any license-exempt allocation.**

Q34. 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.

VIL Comments to Q. No. 34

No comments.

Q35. 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.

And

Q36. 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.

VIL Comments to Q. No. 35 and 36

1. To lay modern high capacity networks, TSPs require equally efficient backhaul networks to enable the customers to have an always connected experience. Due to proliferation of high data rate radio network, the need for high-density and high-capacity backhaul networks will keep on increasing every year. Delivering flawless connectivity for 5G,

demands a transport backhaul that can support massive connectivity, super-high data rates and ultra-low latency.

2. **Assignment on Point-to-Point (P2P) link or Block basis**

   a. Kindly refer to our comments to Question no. 3 and 4 above. We again strongly urge that the assignment of 6 (lower)/7/13/15/18/21 GHz bands for radio backhaul, should be done only on block basis i.e. for entire LSA only.

   b. It is important to maintain robustness, certainty and uniformity in spectrum assignment and pricing methodologies. Spectrum being one of the major cost-element of telecom networks, any deviation from uniform policies, can disturb level playing field and provide benefit to certain entities at the cost of others.

   c. Point to Point allocation is technically and operationally inefficient whereas, at the same time, the charges are required to be paid based on AGR for entire LSA.

   d. The present access licensing and spectrum assignment framework is LSA based hence, the network designing, planning and deployments are on LSA level only. TSP may require different quantity of channels in different LSAs depending upon their stage of their deployments, traffic etc. Any depart from LSA based framework, is expected to bring inefficiencies as well as non-level playing field.

   e. **Therefore, we once again strongly urge that the spectrum in all traditional microwave backhaul bands (all spectrum bands irrespective of MWA or MWB), should be allocated on block-basis for entire LSA, for radio backhaul purposes.**

3. **Spectrum Charges - <u>Per Carrier or Per MHz</u>:**

   a. For any potential use of the backhaul spectrum on LSA basis, minimum 1 carrier size spectrum assignment is required.

   b. Given this, the spectrum charges should be levied based on the number of carriers assigned to a TSP in an LSA, over and above the carriers being bundled with the access spectrum.

   c. The Radio Backhaul spectrum is not a direct revenue generating spectrum and there is an immediate need to significantly rationalize the spectrum charges to be paid.

4. **Spectrum Charges - <u>As a percentage of Adjusted Gross Revenue</u>:**

   a. The Traditional microwave radio backhaul bands based networks are essential to deliver high performance in a cost-effective way, as we migrate to high speed data-rate modern communication system and services. With proliferations of the high

capacity all IP Access networks and ever improving technologies, the TSPs we have been always looking at various ways to make efficient use of the available resources.

b. At present, the access spectrum is provided through auction and it takes care of the revenue potential from access services. Also, as explained in this response, a sufficient amount of backhaul spectrum is essential for effective use of access spectrum being acquired in the auctions by paying the Auction Determined Price (ADP).

c. **Hence, we suggest that a pre-determined number of blocks of Traditional microwave radio backhaul spectrum bands shall be bundled with the different bands of access spectrum being provided through the auctions based on a predetermined formula such that the standard backhaul requirements of the Telcos are met through such bundled backhaul spectrum. E.g. for each 5 MHz block of 1800 MHz spectrum (or any other < 3 GHz band) being put to auction 2 carriers for Traditional microwave radio backhaul spectrum bands shall be bundled along with the same.**

d. For allocation beyond 2 carriers as mentioned in preceding point irrespective of the total access spectrum holding in < 3 GHz spectrum bands, the traditional microwave backhaul spectrum bands should continue to be priced as a percentage of AGR and per carrier basis. TSPs then shall be free to apply for administrative allocation of additional carriers upto the ceiling limit on the basis of additional charges which shall be computed as % of AGR.

e. The pricing of Traditional microwave radio backhaul spectrum bands was fixed at 0.15% of AGR for 1 carrier (with non-linear increase with additional no. of spots) at a time when access spectrum was also being provided administratively. However, since the access spectrum is being now provided through auction and it takes care of the revenue potential from access services.

f. **Considering that the Backhaul spectrum is not a direct revenue generating spectrum there is an immediate need to significantly rationalize the spectrum charges to be paid for Traditional microwave radio backhaul spectrum bands, applicable for number of carriers assigned to a TSP in an LSA, over and above the carriers being bundled with the access spectrum.**

g. f for an operator. The annual charges broadly per block works out to be not more than 0.05% of the AGR as per our analysis.

h. **Therefore, the Spectrum charges should be reduced to not more than 0.05% of AGR for 1 carrier of Traditional microwave radio backhaul spectrum bands.**

i. **Also, currently there is a non-linear increase in the charges based on the number of carriers. This non-linear increase for additional carriers shall be done away with and uniform rate of not more than 0.05% per carrier shall be applicable for every additional carrier being taken by a TSP.**

Q37. 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.

And

Q38. 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.

And

Q39. 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.

VIL Comments to Q. No. 37, 38 and 39:

1. The spectrum so far has been technology neutral and should continue to be. Earmarking any spectrum for a specific technology or service (like FWA) would be highly inefficient and disturb the level playing field.

2. There are many access licensed bands as well as unlicensed bands, which can serve the market requirements and address last mile challenges like large frequency blocks in mmWave spectrum with existing TSPs, upcoming unlicensed spectrum in lower 6 GHz band.

3. **In our view, no quantum of spectrum in traditional microwave backhaul bands should be earmarked for last mile connectivity (Fixed Wireless Access).**

4. Further, allowing flexible use i.e. backhaul as well as last mile connectivity, would be against the provisions of the Telecommunications Act 2023, which envisages administrative allocation for radio backhaul spectrum and auction for access spectrum.

Q40. 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.

and

Q41. 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.

VIL Comments to Q. No. 40 and 41

1. Given the importance of radio backhaul to access telecom networks, no quantum of spectrum should be removed from the traditional microwave radio backhaul bands for earmarking for the point-to-point connectivity requirements of captive (non-commercial/non-TSP) users.

2. The radio backhaul spectrum should be provided only on block basis (i.e. for entire LSA) to access operators and no point-to-point link basis approach be followed.

3. In our view, allocation spectrum as service specific will create fragmentation issues, arbitrage as well as complicate pricing. The consultation paper also doesn't provide any detailed opportunity cost and value analysis, which is crucial to be carried out before fragmenting spectrum.

4. It is important to note that there is substantial unlicensed band available and can help serve the demand of such captive (non-commercial/non-TSP) users. Besides, Government is also looking at providing more unlicensed spectrum in lower 6 GHz band.

5. **Therefore, we recommend that there should not be any direct spectrum allocation to non-commercial/non-TSP users.**

6. In addition to above, the demand of captive (non-commercial/non-TSP) users can also be met through spectrum leasing by access providers. For this, the policy framework should allow spectrum leasing by access service provider on P2P links basis. It is important to recognize that regulated structures (in this case administrative assignments on P2P links basis) should be resorted to, only if the market is not able to fulfill the demand of such captive (non-commercial/non-TSP) users and there is market failure for a reasonable period of time and it is not possible to course-correct such market failure through any other means/measures. The TRAI and DoT can review the market after few years, if there is demand of captive (non-commercial/non-TSP) users and if it is not met through spectrum leasing option provided to Access service providers.

7. **Therefore, the Authority can look into recommending a framework allowing sharing option through spectrum leasing on P2P links or geography basis.**

Q42. 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.

and

Q43. 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.

And

Q44. 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.

and

Q45. 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.

VIL Comments to Q. No.42, 43, 44 and 45

1. The requirement of E-band and V-band carriers is critical to rollout newer technologies and hence should be treated as an essential resource. To cater to the consumption levels under 4G and 5G services, the backhaul has to either move to fiber or to a dedicated high-bandwidth spectrum band. As fiberization would take some more time, the backhaul spectrum bands including E-band, V-band, MWA and MWB would gain prominence and would be highly useful.

2. **Assignment on Point-to-Point (P2P) link or Block basis**

   a. Kindly refer to our comments to Question no. 21 and 22 above. We again strongly urge that the assignment of E band and V-band for radio backhaul, should be done only on block basis i.e. for entire LSA only.

   b. It is important to maintain robustness, certainty and uniformity in spectrum assignment and pricing methodologies. Spectrum being one of the major cost-element of telecom networks, any deviation from uniform policies, can disturb level playing field and provide benefit to certain entities at the cost of others.

   c. Point to Point allocation is technically and operationally inefficient whereas, at the same time, the charges are required to be paid based on AGR for entire LSA.

   d. The present access licensing and spectrum assignment framework is LSA based hence, the network designing, planning and deployments are on LSA level only. TSP may require different quantity of channels in different LSAs depending upon their stage of their deployments, traffic etc. Any depart from LSA based framework, is expected to bring inefficiencies as well as non-level playing field.

e. **Therefore, we once again strongly urge that the spectrum in E-band and V-band should be allocated on block-basis for entire LSA, for radio backhaul purposes.**

3. **Spectrum Charges - <u>Per Carrier or Per MHz</u>:**

   a. For any potential use of the backhaul spectrum on LSA basis, minimum 1 carrier size spectrum assignment is required.

   b. Given this, the spectrum charges should be levied based on the number of carriers assigned to a TSP in an LSA, over and above the carriers being bundled with the access spectrum.

   c. The Radio Backhaul spectrum is not a direct revenue generating spectrum and there is an immediate need to significantly rationalize the spectrum charges to be paid.

4. **Spectrum Charges - <u>As a percentage of Adjusted Gross Revenue</u>:**

   a. The E-band and V-band is essential to deliver high performance in a cost-effective way, as we migrate to high speed data-rate modern communication system and services. With proliferations of the high capacity all IP Access networks and ever improving technologies, the TSPs we have been always looking at various ways to make efficient use of the available resources.

   b. At present, the access spectrum is provided through auction and it takes care of the revenue potential from access services. Also, as explained in this response, a sufficient amount of backhaul spectrum is essential for effective use of access spectrum being acquired in the auctions by paying the Auction Determined Price (ADP).

   c. **Hence, we suggest that a predetermined number of blocks of E-band/V-band spectrum shall be bundled with the different bands of access spectrum being provided through the auctions based on a predetermined formula such that the standard backhaul requirements of the Telcos are met through such bundled backhaul spectrum. E.g. the 3300 MHz band is primarily being used to provide 5G services, 2 carriers for E band spectrum should be bundled with each 40 MHz of 3300 MHz spectrum.**

   d. For allocation beyond 2 carriers as mentioned in preceding point, the E-band/V-band should be priced as a percentage of AGR and per carrier basis. TSPs then shall be free to apply for administrative allocation of additional E-band/V-band carriers upto the ceiling limit on the basis of additional charges which shall be computed as % of AGR.

   e. The pricing of E-band spectrum was fixed at 0.15% of AGR for 1 carrier (with non-linear increase with additional no. of spots) at a time when traditional microwave radio

backhaul bands were also priced at 0.15%, which had been prescribed historically from the time when access spectrum was also being provided administratively. However, since the access spectrum is being now provided through auction and it takes care of the revenue potential from access services.

f. Therefore, considering that the Backhaul spectrum is not a direct revenue generating spectrum there is an immediate need to significantly rationalize the spectrum charges to be paid for any backhaul band including E-band spectrum, applicable for number of carriers being used by a TSP over and above the carriers being bundled with the access spectrum.

g. In case a benchmarking is to be done to the current Auction Determined Prices (ADP), the earlier method of arriving valuation using the auction pricing of closest spectrum band. The valuation may therefore be worked out basis the auctioned value of mmWave spectrum band. If we consider various factors viz. the mmWave auction winning price for 20 years, % discount to the auctioned value of mmWave spectrum band considering the scope of services being backhaul and propagation characteristics, derivation of annual value of such amount, number of blocks required by an operator and the average annual AGR for an operator. The annual charges broadly per block works out to be not more than 0.05% of the AGR as per our analysis.

h. **Therefore, there is an immediate need to rationalize the spectrum charges to be paid for these bands. The Spectrum charges shall be reduced to a rate note more than 0.05% of AGR for 1 carrier of E-band/V-band spectrum and there should be a uniform rate of not more than 0.05% per carrier shall be applicable, for every additional carrier being taken by a TSP beyond bundled carriers.**

Q46. In case it is decided to assign some frequency spectrum 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:
(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.

and

Q47. In case it is decided to assign some frequency spectrum 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:

i. Should the auction determined price of other countries in E-band (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 E-band (71-76/ 81-86 GHz) and/or V-band (57-64/66 GHz)? Please provide detailed information.

And

Q49. 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:
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.

And

Q50. 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.

And

Q51. 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 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.

And

Q52. 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.

VIL Comments to Q. No. 46, 47, 49, 50 and 51

1. While 5G and upcoming access technologies provide wireless broadband experience to end users with huge data quantum consumption, backhaul of such huge data is a challenge in today's era. E band and V Band is a ray of hope to enable faster and meaningful rollout of 5G connectivity.

2. Since there is a very limited spectrum available in E/V band spectrum, sharing it for Access/IAB will further lead to reduction of spectrum for Backhaul purposes and subsequently, will limit effective utilisation of acquired Access spectrum with congested backhauls.

3. Besides, there is ample spectrum available for access including mmWave spectrum which was bought during last auction. TSPs have not been able to garner much deployments and use-cases in mmWave spectrum presently. As such, it is advised to refrain from utilizing E-band/V-band for access/IAB purposes, preserving its current value as well as avoiding potential pricing complications.

4. The argument of bringing access aspect into E-band and V-band utilisation is indirectly meant to bypass provisions of The Telecommunications Act, 2023 ('Act') which allows radio backhaul to be provided through administrative assignments. If E-band and V-band is considered for both access as well as backhaul, it would inflate its valuation manifold. This will make the adequate number of carriers for backhaul purposes, beyond a reasonable financial level thereby, hurting 5G deployments/expansions and would end up benefitting only the deep pocketed players. It will defeat the very objective of the provisions of Act providing radio backhaul on administrative basis.

5. Currently as per DoT norms, there is clear bifurcation of Access and Backhaul spectrum which is working absolutely fine and hence, this framework should continue going forward as well.

6. Further, global evidence of deployments also shows that E-band/V-band is used for backhaul purposes only. Also, global deployments indicate that IAB has not got any encouraging adoption and equipment availability is also limited.

7. **Therefore, VIL strongly recommends that E-band and V-band which provide an evolved and reliable backhaul solution, should be designated exclusively for backhaul of wireless Access technologies (for example 5G, 4G, 2G and upcoming 6G).**

Q48. In case it is decided to assign some frequency spectrum in Eband (71-76/ 81-86 GHz) and/or V-band (57-64/66 GHz) for point-to-point connectivity requirements of captive (noncommercial/ non-TSP) 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.

VIL Comments to Q. No. 48

1. Given the importance of radio backhaul to access telecom networks, no quantum of spectrum should be removed from the evolved E/V bands for earmarking for the point-to-point connectivity requirements of captive (non-commercial/non-TSP) users.

2. The radio backhaul spectrum should be provided only on block basis (i.e. for entire LSA) to access operators and no point-to-point link basis approach be followed.

3. In our view, allocation spectrum as service specific will create fragmentation issues. The consultation paper also doesn't provide any detailed opportunity cost and value analysis, which is crucial to be carried out before fragmenting spectrum.

4. It is important to note that there is substantial unlicensed band available and can help serve the demand of such captive (non-commercial/non-TSP) users. Besides, Government is also looking at providing more unlicensed spectrum in lower 6 GHz band.

5. **Therefore, we recommend that there should not be any direct spectrum allocation or earmarking for non-commercial/non-TSP users.**

6. In addition to above, the demand of captive (non-commercial/non-TSP) users can also be met through spectrum leasing by access providers. For this, the policy framework should allow spectrum leasing by access service provider on P2P links basis. It is important to recognize that regulated structures (in this case administrative assignments on P2P links basis) should be resorted to, only if the market is not able to fulfill the demand of such captive (non-commercial/non-TSP) users and there is market failure for a reasonable period of time and it is not possible to course-correct such market failure through any other means/measures. The TRAI and DoT can review the market after few years, if there is demand of captive (non-commercial/non-TSP) users and if it is not met through spectrum leasing option provided to Access service providers.

7. **Therefore, the Authority may additionally look into recommending a framework allowing sharing option through spectrum leasing on P2P links or geography basis.**

Q53. Any other suggestions relevant to the subject may be submitted with detailed justification.

VIL Comments to Q. No. 53

No comments

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