

05 May 2014

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**Subject: Response to Consultation Paper on 'Allocation and Pricing of Microwave Access (MWA) and Microwave Backbone (MWB) RF Carriers' (No 02/2014) dated 28.03.2014**

Dear Sir,

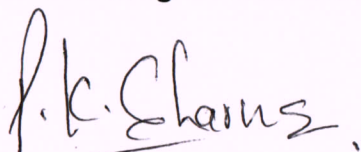
Please find enclosed our response to the Consultation Paper subjected above.

We hope that the Authority will find our response useful and consider our inputs while formulating the recommendation on the subject.

Thanking you,

Yours sincerely,

**For Telewings Communications Services Private Limited**



**(Pankaj Sharma)**

Sr. Vice President and  
Head Regulatory

Encl: a.a.

## Uninor Response

to

### **TRAI Consultation Paper on Allocation and Pricing of Microwave Access and Microwave Backbone RF Carriers (CP 2 of 2014)**

#### **Preamble**

The advent of 3G and 4G mobile services brings with it surge in data traffic which in turn puts a strain on existing mobile networks. It is also a fact that nowhere is the demand for more available capacity felt more than in the Backhaul connectivity. There are mainly three backhaul options available for a telecom service provider (TSP) to rollout its network – Fiber, Microwave or copper and out of which microwave is the cheapest option accounting nearly 50% of global backhaul deployments. Microwave (MW) brings advantages such as flexibility in rollout design, durability and speed of rollout) that lead to lower Total cost of ownership (TCO). There are other factors which also motivates TSPs to prefer microwave in compare to fiber like laying fiber is not feasible due to difficult terrain, time constraint or economical viability especially for new operators who is in process of setting its network.

For a new licensee, backhaul connectivity is critical to meet its rollout obligation, the 1<sup>st</sup> year milestone is to be met within 1 year from the date of license / access spectrum whichever is later. This is common knowledge that MWA is mandatorily required for rollout of network between aggregation point / OFC POP to the next set of BTSs in the chain. This necessitates the need of minimum 2 MW access carriers (28 MHz each) of MWA spectrum. The rollout in a difficult terrain like Assam, North East, Jammu & Kashmir, Himachal Pradesh necessitates at least 1 carrier of MWB carrier for backhauling between cities.

The above shows the increasing importance of microwave for TSPs in meeting its backhaul requirements, as the fibre is not universally available at all sites. Therefore, **TRAI should recommend to DoT for allocation of 2 MWA carriers and 1 MWB carrier for rollout of new network, while allocation of 3<sup>rd</sup> and higher carriers should be on the basis of utilization by TSPs of their existing allocations.**

Our submissions are as follows:

- **New operator should be allocated minimum 2 MWA carriers and 1 MWB carrier immediately to start their network to meet their rollout obligation.**
- Allocation of additional MW carriers (3<sup>rd</sup> and above carrier) should be based on audit of existing allocated carriers and assessment of future requirements. Sufficient safeguards should be built to avoid possible hoarding.
- Need based administrative assignment mechanism should be continued instead of auction for allocation of microwave links in line with international practices.

- Current charging regime of AGR based charging should be continued for both MW Access & Backbone. However a flat rate of 0.1% of AGR should be considered.

**Uninor Response to the issues under consideration**

**Q1. How many total Microwave Access and Backbone (MWA/MWB) carriers should be assigned to a TSP deploying:**

- 2G technology only.
- 3G technology only.
- BWA technology only.
- Both 2G and 3G technologies.
- 2G and BWA technologies.
- 2G, 3G and BWA technologies.

**Please give rationale & justification for your answer.**

**Response for Q1:**

Microwave plays a very important role as a facilitator in rapid deployment of network and offer service to the customers. Normally while deploying a Base Station, first exercise that is carried out is to ascertain the feasibility of deploying using a leased media using (a) Optical or (b) Microwave in that order. Own Microwave media is used in third party non-feasible situation for connecting the Base Station to a near by transmission hub. All our Base Station Controllers are connected using fibre media only. Over a period of time as and when an alternate fibre media becomes available we have been switching over from own microwave media to fibre media.

Uninor has deployed / expanded its network in seven phases. Table given below gives a perspective of media used (leased fibre / MW and Own MW), besides year on year migration that has happened from own microwave to leased media.

Phase	% of Own MW Media
Phase-1	25%
Phase-2	46%
Phase-3	47%

In general there is low penetration of fiber, combined with the issue of last mile connectivity. While in the urban areas, securing ROW permissions is a major issue, in Tier-II & Tier-III cities the availability of fibre on far end is an issue. Smaller towns are connected on PDH radios hence extra bandwidth is not available for sharing amongst TSPs.

In many cases a fibre media can be economically unviable coupled with timeline for its implementation being too large. From a roll-out timeline consideration it would be prudent to start operations on a Microwave access and at a later date migrate to fibre subject to there being enough economic justification to do so.

Hence, there is a complete dependency on MW links for designing the access network as well as backhauling between cities.

**MW Access** – Operators like Uninor are planning 95% of their access network using MW links and hence at majority of the sites in the network (in 1800 band) we need to install 3 to 4 and in many cases more MW links on the same site. The tenancy on these HUB sites are generally of the order of 2 to 4. Hence, it becomes difficult to get height difference to install MW links on these HUB site while designing access network with allocated 2 MWA carriers. Due to interference issues the *Automatic Transmit Power Control (ATPC)* feature is triggered and practically the bandwidth is reduced.

In view of the above, we recommend the following minimum MW access carriers required for 2G network rollout :-

Service	Metro & A - circle	B - Circle	C - circle
2G	4 - 5	3 - 4	2 - 3

**MW Backbone:** The backhaul connectivity for BHQs and smaller towns require deployment of wireless technology as fibre may not be available in all locations. As we expand our networks to smaller cities, the Hop length increases (>20 KM) and reliable links cannot be established using 18/ 21GHz links, hence a MWB carrier in 6 / 7 Ghz is required for a stable inter-city link.

In Hilly regions of Assam, North East, Jammu & Kashmir and Himachal Pradesh, it is technically not possible to rollout the network without having at least two MW backbone carrier.

The recommendation of the TEC committee, which also is part of the DOT reference to TRAI (para 2.18) should be adopted and be made part of the License condition.

**Q2. How many MWA/MWB carriers need to be assigned to TSPs in case of 2G, 3G and BWA at the start of their services [ i.e. at beginning of rolling of services] Please justify your answer.**

**Response for Q2:**

Minimum 2 MWA carriers in 15 / 18 Ghz and 1 MWB carrier in 6 / 7 GHz should be assigned for rollout of new network, the detailed justification is provided in response to Q1. This allocation should be done within 2 weeks of allocation of new License / additional authorisation in order to meet the 1<sup>st</sup> year rollout obligation.

**Q3. Should excess spectrum be withdrawn from existing TSPs?**

**Q4. If yes, what should be the criteria for withdrawal of excess allocation of MWA and MWB carriers, if any, allocated to the existing service providers?**

**Response for Q3 & Q4:**

MW is required initially by TSP for faster rollout of network and later on shift to Fiber and other technologies depending upon its traffic demand. It is suggested that regular audit should be carried out with the following criteria to ensure optimal and efficient use of allocated MW carriers:

- 1<sup>st</sup> & 2<sup>nd</sup> MWA carrier – forthwith grant of new License
- 3<sup>rd</sup> MWA carrier and above –
  - No. of hops operational in the service area
  - No. of hops migrated to fiber over a period of time.
  - No. of network covered towns having more BTSs > 25, >50 and >100 BTSs.
  - No. of microwave hub sites in the network
  - Percentage of Geographical area having network coverage within service area.

Based on the audit report, TSPs should be incentivized for migration to OFC where they feel the need to surrender excess carriers.

**Q5. What should be the preferred basis of assignment of MWA/MWB carriers to the TSPs i.e. 'exclusive basis assignment' or 'link-to-link based assignment'?**

**Response to Q5:**

For MW Backbone, the assignment should be made on link-to-link non-exclusive basis, whereas MW Access assignment in 13/ 15/ 18/ 21 GHz should be done on exclusive service area basis. The bands higher than 26GHz has not been allotted for mobile applications, hence no legacy issues. In these higher bands link-to-link based assignment should be the preferred basis of assignment. In higher frequency bands with large bandwidth, some spectrum blocks could be set aside for exclusive basis assignment.

Spectrum band allocation must also keep in mind type of terrain and extreme weather conditions prevalent in the state. For example hilly terrain or fog infected Uttarakhnad or high rain intensity states like Assam or North-East should be allocated Microwave spots from lower band in the 13 / 15 GHz band for complying to network availability / Quality of Service requirements.

As may be seen from the compilation of the assignment criteria in some of the countries below, link-by-link assignment through administrative means is majorly adopted.

Country	Bands used	Remarks
Thailand	7/8 GH links are commonly used by mobile operators. There is a very high availability of fibre.	Per-link based assignment
Malaysia	6/7/8GHz, 10-15GHz, 17-19GHz and 21-23GHz are used	Per-link based assignment. First-come first served
Bangladesh	Various assignments up to 38 GHz	Per-link based assignment
France	1.5, 3.5, 4, 6, 7-8, 11, 13, 18, 23, 26, 28, 32, 38, 71-76/81-86 GHz	Per-link based assignment. In some bands, certain “preferential channels” are assigned to specific operators
United Kingdom	1.4 GHz, 4GHz, Lower 6 GHz, Upper 6 GHz, 7.5 GHz, 13 GHz, 15 GHz, 18 GHz, 23 GHz, 26 GHz, 38 GHz, 52 GHz, 55 GHz, 71-76/81-86 GHz	A few bands have been auctioned and some bands are available unlicensed, but per-link based assignment are available in a number of bands
Denmark	In Denmark, the mobile operators use the following spectrum: 7/8, 14/15, 18/19, 26, 32 and 38 GHz bands	Per-link based assignment. In some cases, the assignments are per-area

**Q6. In case ‘exclusive basis’ assignment is preferred, whether MWA and MWB carriers should be assigned administratively or through auction. Please comment with full justifications.**

**Q7. In case ‘link-to-link basis’ assignment is preferred, how the carrier assignment for different links should be carried out, particularly in nearby locations?**

**Response for Q6 & Q7:**

Auction as a method of allocation in MW band is not followed globally. It is also important to highlight that MWA allocation is a facilitator for the growth of TSP network and end result being overall increase in its traffic. This translates to increase in Government value capture through higher License fee and Spectrum Usage Charges.

As stated earlier microwave acts as an interim access media for rapid deployment of base stations. Given a choice of there being an available fibre media the first choice will always be a fibre media due to quality and available capacity consideration. So naturally microwave access is only an interim solution until such time the fibre media gets built up. Fibre media itself gets built when there is a business case. Microwave media should be viewed as an alternate access transmission link and its costing should be seen from what would an access link would be charged using the existing tariff table prescribed the TRAI.

The link-to-link basis assignment should be through an automatic route, where WPC acts as a facilitator and TSPs apply through an on-line process and assignments are done within 30 days. The interleaving period is for interference study.

there are both technical issues and operator requirements that must be considered. Moreover, the traffic volumes are increasing fast and a spectrum allocation should have in mind that operator will need to modify and upgrade the microwave network in the future.

Specific comments are listed below for block allocation and for link-by-link allocation.

**Block allocation per operator:**

- It is preferably with a block allocation such that the operator can plan the network and develop as per business requirements.
- With block allocation it is also easier to ensure good deployment of spectrum such as using the more advanced technologies automatic transmit power control (ATPC) and adaptive modulation and coding (ACM) since only one single network operator controls all sites affected.

**Link by link allocation for several operators in a service area:**

- Careful specification of technical aspects such antennas performance, i.e., well-defined transmission masks (e.g., as specified in ETSI standards) and internationally standardised propagation prediction methods (i.e., ITU-R P.452).
- It may be wise to not allow ATPC as this creates a much more complex interference scenario and is difficult to implement with several operators each with their own microwave system and frequency licences.
- It may be wise to not allow ACM of similar reasons as ATPC

**Q8. Considering the fact that different TSPs may require additional carriers at different point of time, what should be the assignment criteria for allocation of additional carriers for MWA and MWB?**

**Response to Q8:**

The requirement of MW Access & MW Backbone is mandatory in the initial phase of rollout of new network by TSPs. As stated earlier, a minimum of one MWA carriers (of 28 MHz each) and one carrier of MWB (6 or 7 GHz Band) should be administratively allocated initially along with a new License. Thereafter based on utilization & other criteria mentioned in response to Q. No. 4 above, additional carriers may be allotted.

Additional carriers should be allocated depending upon the concentration of microwave links used in the network in a particular region constraining further planning of links using available spots without impacting quality of service. Additionally multiple spots allocation using mixed band would enable better Network planning and hence need for additional carriers could get postponed.

**Q9. How can it be ensured that spectrum carriers assigned are used optimally and the TSPs are encouraged to move towards the OFC?**

**Response to Q9:**

As suggested above in Q3 & Q4, competent authority should carry out an audit to assess utilization of allocated carriers to ensure optimal use and level playing field among all TSPs. The principle of audit may be based on the following parameters -

- Geographical area coverage
- Population served
- Quantum of Frequency ( No. of carriers)
- Financial Incentives for migrating to alternate arrangements like fiber

We suggest the following incentive mechanism for encouraging TSPs to attract towards OFC -

- Uniform policy for ROW permissions across states with reasonable charges, eventually freeing up of spots in 6 / 7 Ghz
- Migration of incumbent occupants from revenue sharing bands (13/15/18/21) to fixed charge bands (26/28/32/42). The fixed changes in higher bands should be minimal to facilitate migration.
- Some blocks in higher bands can be de-licensed

**Q10. Should an upfront charge be levied on the assignment of MWA or MWB carriers, apart from the annual spectrum charges?**

**Response to Q10 :** Any upfront charge should not be levied on TSPs, **MW is a facilitator** and TSPs are providing Spectrum Usage charge and License fee as per the defined slabs to the Government. However usage based threshold to be defined and implemented to avoid hoarding.

**Q11. What should be the pricing mechanism for MWA and MWB carriers? Should the annual spectrum charges be levied as a percentage of AGR or on link-by-link basis or a combination of the two?**

**Q12. In case of percentage AGR based pricing, is there any need to change the existing slabs prescribed by the DoT in 2006 and 2008? Please justify your answer.**

**Response for Q11 & Q12:** As highlighted in response to Q10, MW is a facilitator for TSPs to rollout their services hence it is **strongly recommended** that for both **MWB & MWA**, flat rate of **0.1% of AGR** should be charged as Annual Spectrum charges for first & second

**carrier.** However, optimal & efficient utilization of Microwave carrier should be enforced through audit mechanism. This should form a basis for future allocation.

The circular prescribing the slabs in 2006 and 2008 are not in vogue, same may be discarded.

**Q13. In case link-by-link based charging mechanism is adopted then:**

**(a) Should the spectrum be priced differently for different MW spectrum bands (6GHz/7GHz/13GHz/ 15GHz/18GHz/21 GHz/26 GHz/28GHz/32GHz/42 GHz etc)? If yes, by what formula should these be charged?**

**(b) What are the factors (viz as mentioned in para 3.22), that should appear in the formula? Please elaborate each and every factor suggested.**

**Response to Q 13:**

The allocation of carriers in **6 / 7 GHz** should continue on **link-to-link basis** with a flat SUC of 0.1% of AGR. Beyond 1<sup>st</sup> carrier, the allocation should be on the basis of audit.

The allocation in **13 / 15 / 18 / 21 Ghz** should continue on **exclusive basis** with a flat SUC of 0.1% of AGR. Beyond 1<sup>st</sup> and 2<sup>nd</sup> carrier, the allocation should be on the basis of audit.

It is suggested that **26 GHz to 42 GHz band** should be assigned on **link-to-link basis** but with light touch regulation. Licenses can be issued through the automatic route, however suitable harmful interference studies should be performed prior to allocation. The SUC should be on cost basis.

**Q14. Should the option of assignment of MWA carriers in all the spectrum bands in 6-42 GHz range be explored in line with other countries? What are the likely issues in its assignment MWA carriers in these additional spectrum bands?**

**Response:** Yes, more bands should be opened for the Fixed Service. There is no need to require high-density networks. Suitable sharing criteria with other services can be developed.

**Q15. In your opinion, what is the appropriate time for considering assignment of MWA carriers in higher frequency bands viz. E-band and V-band?**

**Response:**

**V-Band (57-64 GHz):** In this band the oxygen absorption characteristic ensures that these links can be used for 1.5 to 2 Km distances, reducing the risk of interference at minimum. Hence, this

should be un-licensed and reporting requirement should be mandated with details of location, spot frequency uses, antennae gain etc. for the purpose of maintaining records.

**E-Band** (71-76 and 81-86 GHz): This band has favourable propagation characteristics, the international practice is link-by-link assignment in this band.

**Q16. Should E-band be fully regulated or there should be light touch regulations?**

**Response:** Light touch licensing should be applied in E-band.

**Q17. What charging/pricing mechanism would be appropriate for these bands?**

**Response:**

These bands should be used for providing rapid and economical deployment for dense urban routes for FS (Fixed Service). Essentially this should be used for peering links between high data usage sites located on highrise buildings. Efforts should be made to decongest networks over short distances (1 to 2 Km) using E & V band, while 15 / 18/ 21 GHz may continue to be used over relatively longer distances.

We believe that these bands are suitable for light touch regulations. The administration could take the responsibility of making operator data publically available while the operators take responsibility of interference analysis. Data should be made available by WPC including date of application, bandwidth, equipment type, location and antenna gain and radiation pattern in public domain. Licenses can be issued when suitable harmful interference studies have been performed by the operator with a "date of priority" to assist in any dispute resolution. In case more than 1 application is received on a single date, simple method of lottery can be used in those cases where the available carriers are less than the number of applicants.

In view of above submission, in line with the international practices, we suggest TRAI to recommend DoT to de-license V-Band (57 to 64 GHz) and light touch regulation in E-Band (71-76 GHz) with cost based pricing may be adopted for E Band.

**Q18. Apart from Q1-Q17, stakeholders are requested to bring out any other issue, which needs to be examined, with justification.**

**Response:**

Please find below a Note on 'Interference considerations for microwave link frequency allocations'

Once a specific radio frequency is re-used the possibility of interference must be evaluated. The basic information needed includes exact transmitter and receiver locations, transmission powers, antenna radio patterns, and receiver performance such as signal threshold. Links geometry and time varying propagation phenomena may result in harmful interference. The ITU-R Recommendation P.452, the most recent version is P.452-15 from 2013, provides methods to calculate the interference level exceeded at a specified percentage of time such as average year and average worst month due to several propagation mechanisms such as clear air layered atmosphere and rain.

The operators must decide on wanted capacity and link availability. Then careful investigation of link profiles for the systems in question using reliable information on local climate enables an estimate of expected interference such that the network details can be established and links designed to meet wanted performance.

It must be noted that the traffic increases continuously and the operator may have to increase the capacity in the network sometime in the future, but still wants to use the same licence. One possibility to increase the capacity is to deploy radio links with higher modulation levels. In such a case to meet the same quality requirements the signal to noise and interference ratio must be increased as well. However, it may not be trivial to increase the antenna sizes and/or transmit power hence the link availability will be reduced. The main concern is that the link will be more sensitive to interferences. The practicality here is a judgement for the traffic growth for the site and possible future modification of the network must be considered at the time of spectrum allocation.

Finally, also for interference the method of allocation is of interest. If the block allocation is provided the operators can themselves deploy the spectrum in an efficient way adapted to their network needs and constraints. If allocation is given on a link by link basis it may take longer time to make changes and the risk of destructive interference increases with several possible changes in a row when dealing with the various spectrum users.

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