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**Shri Akhilesh Kumar Trivedi**  
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**Telecom Regulatory Authority of India,**  
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New Delhi – 110029

**Subject : OneWeb India's Comments on Consultation Paper on *Terms and Conditions for the Assignment of Spectrum for Certain Satellite-Based Commercial Communication Services***

**Reference : TRAI's Consultation Paper dated 27<sup>th</sup> September 2024**

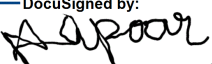
Dear Sir,

This is in reference to TRAI's Consultation Paper on *Terms and Conditions for the Assignment of Spectrum for Certain Satellite-Based Commercial Communication Services* dated 27.09.2024.

In this regard, we are pleased to enclose our comments on the said consultation paper for your kind consideration.

Thanking You,

Yours Sincerely,

DocuSigned by:  
  
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Nishtha Kapoor

On behalf of **OneWeb India Communications Private Limited**

Encl: a.a

## **Consultation Paper on “Terms and Conditions for the Assignment of Spectrum for Certain Satellite-Based Commercial Communication Services”**

At the outset, we thank the Telecom Regulatory Authority of India (TRAI) for providing us with this opportunity to comment on the Consultation Paper (“CP”) titled ‘*Terms and Conditions for the Assignment of Spectrum for Certain Satellite-Based Commercial Communication Services*’, the formulation of which is critical to our business.

We wish to start by highlighting the importance of satellite communications (SatCom) and our commitment to advancing the Digital India.

Satellite-based communication systems can provide coverage to the remotest and most inaccessible areas of a geographically widespread country like India. At present, many sparsely populated areas, including those of strategic importance and those important from a socio-economic perspective, do not have mobile terrestrial coverage or other forms of connectivity. Communication satellites have the potential to bridge this gap by providing services to even the remotest areas. They can also cater to strategic defence requirements and improve the disaster resilience of the country.

Although traditional markets (rural, remote, hitherto unconnected & Government strategic locations/ areas) are primary targets for SatCom to serve conventional use cases in the non-retail segment (e.g., SatCom connectivity-based solutions for Defence, public sector undertakings, government agencies, cellular backhaul, disaster response, etc.), there are some NGSO satellite operators who are creating massive capacity to compete directly with terrestrial operators in the retail and urban markets. Such operators might also engage in predatory pricing to attract customers and this can have larger negative impact on the wider SatCom ecosystem. In addition such satcom players also directly compete with terrestrial operators given the nature of their service offerings.

Therefore, in order to ensure overall growth of SatCom ecosystem and investments, it is crucial that issues concerning level playing field qua terrestrial operators and issues of retail/ no retail segment offerings are adequately addressed while framing the policy and regulatory framework of spectrum pricing for SatCom. The Authority must prevent large-capacity SatCom operators from resorting to predatory pricing.

Below is our response to specific questions raised in the CP, and we request that the same be read in light of the submission made above.

**Q1. Which frequency band(s)/range(s) should be considered for the assignment to NGSO based Fixed Satellite Services for providing data communication and Internet service? Please provide a detailed response separately for the user link and feeder link.**

### **Response:**

There are several types of NGSO systems operating today which can provide high data rate/broadband services (e.g., 30 to 200 Mbps):

One type of NGSO systems, e.g., OneWeb, use Ku-band FSS allocations for the transmit (satellite terminals) 14.0-14.5 GHz and for the receive (satellite terminals) 10.7-12.7 GHz. Their feeder-link frequencies are provided in the Ka-band FSS allocations whose Earth stations transmit in the range 27.5-29.1 & 29.5-30.0 GHz and receive in the 17.8-18.6 & 18.8-19.3 GHz.

Other type of NGSO systems only uses the Ka-band FSS allocations for both service and feeder links.

There is yet another type of NGSO systems, which use inter-satellite links for their feeder-links.

**Q2. Which frequency band(s)/range(s) should be considered for the assignment to GSO/NGSO based Mobile Satellite Services for providing voice, text, data, and Internet service. Please provide a detailed response separately for the user link and feeder link.**

**Response:**

These services are for narrow band (but still with data rates reaching 1 Mbps). They should use the L-band and S-band MSS allocations for the service links, i.e., the frequencies between 1.5/1.6 and 2.0/2.2 GHz allocations. Their feeder-links are provided in the C-band FSS allocations. Some may also use the Ka-band FSS allocations.

**Q3. What should be the maximum period of assignment of spectrum for –**

- (a) NGSO based Fixed Satellite Services for providing data communication and Internet services, and**
- (b) GSO/NGSO based Mobile Satellite Services for providing voice, text, data, and Internet services?**

**Please provide a detailed response along with international practice in this regard.**

**Response:**

The validity period of the assignment of spectrum should be set at **20 years**, irrespective of being a GSO or NGSO system, to provide enough regulatory certainty to satellite operators who have made long-term investments on their infrastructure. This also corresponds with the validity period of the service authorization. Renewal of the licence should be automatic, unless the SatCom operator informs the regulator that it ended its services.

However, it is critical that all necessary regulatory requirements are clarified by the regulator/licensor at the earliest. Considering the nascent nature of this industry and the need for urgent utilisation of already available satellite resources, the Authority can also consider a lesser validity period, say 3-5 years, to enable an early launch of services.

**Q4. For assigning spectrum for NGSO-based communication services, whether every ITU filing should be treated as a separate satellite system? Please provide a detailed response along with international practice in this regard.**

**Response:**

In general, we suggest that the regulator requests a written statement from the SatCom operator, and/or the satellite operator, stating which satellite filings will be used for their licence.

This would be similar to what the ITU does for declaration if one satellite network or multiple satellite networks are considered when determining the single or aggregate efd for NGSO systems. In that case, the ITU requests a written declaration from the satellite operator, thus providing flexibility and at the same time commitment and understanding how the satellite filings are used.

Such flexibility is needed because the SatCom/satellite operators may need to evolve their business case and/or their satellite terminal technology.

**Q5. Whether the provisions of ITU-RR are sufficient to resolve interference related challenges and coordination issues? If not, what additional conditions should be prescribed while assigning frequency spectrum for –**

**(a) NGSO based Fixed Satellite Services for providing data communication and Internet services; and**

**(b) GSO/NGSO based Mobile Satellite Services for providing voice, text, data, and Internet services?**

**Please provide a detailed response along with international practice in this regard.**

**Response:**

ITU Radio Regulations (Article 9 and Article 11) are the basis of a healthy collaboration between the satellite operators involved. We believe that there is no need to prescribe any additional requirements over and above the ITU-RR.

We ask the regulator to ensure that satellite operators are obliged, through their licence in India, to coordinate their systems under the ITU-RR. If the satellite operator has not yet completed coordination with other satellite operators, then it should be allowed a licence on a “non-interference” and “non-protected” basis.

The process should be similar for earth stations used for feeder-links. However, for the feeder-links there may be a requirement for the satellite operator to notify the ITU Bureau of such earth stations in India for protection purposes.

**Q6. For satellite earth station gateways of different satellite systems operating in the same frequency range, whether there is a need to prescribe a protection distance or any other measures to avoid interference from each other –**

- (a) Between the gateways of GSO and NGSO systems; and**
- (b) Between the gateways of NGSO systems?**

**If yes, please provide a detailed response alongwith international practice in this regard.**

**Response:**

Generally, two gateway stations operating in the same direction of transmission and reception do not interfere with each other. However, there is a possibility of interference in case gateway stations of different satellite networks operate nearby.

**In order to prevent harmful interference, a ‘coordination distance’ of say, 100 km, may be prescribed, requiring an operator wishing to set up a new gateway station within such distance of an existing gateway station to coordinate with such existing gateway station, based on typical ITU coordination processes, for instance, ITU-RR Appendix 7 and/or Appendix 8 procedures.**

Such a mechanism would be in line with the approach followed by the US as well as many European administrations.

**Q7. In case the spectrum assigned for satellite gateway links is also assigned to terrestrial networks such as Fixed Service, IMT etc., what protection distance or criterion should be included in the terms and conditions of the assignment of spectrum for satellite gateway links to avoid any interference to/from terrestrial networks? Please provide a detailed response alongwith international practice in this regard.**

**Response:**

In case the spectrum assigned for satellite gateway links is also assigned to terrestrial networks such as Fixed Service, IMT etc., the following criterion should be included in the terms and conditions of the assignment of spectrum for satellite gateway links to avoid any interference to/from terrestrial networks:

- In case of **uplink frequencies** of feeder links, the terrestrial systems in these frequency bands are highly directional and a “protection distance” would unnecessarily result in inefficient utilization of spectrum. Rather, we suggest that a **“coordination distance” should be adopted**, within which the gateway stations would be required to coordinate with the terrestrial systems, based on typical ITU coordination processes to prevent harmful interference. This coordination distance depends on the terrestrial systems concerned, and are usually around tens of kilometers. Such a mechanism

would be in line with the approach followed by various administrations like Germany, Italy, Portugal, the UK and the US.

- In case of **downlink frequencies** of feeder links, **ITU Radio Regulation Art. 21** contains provision to manage spectrum sharing between satellite and terrestrial services such as Microwave Fixed links. And relevant **ITU recommendations** include mitigation measures that can be adopted to alleviate interference scenarios between satellite service and fixed links.

**Q8. In case the spectrum assigned to the satellite user link is also assigned to terrestrial networks such as Fixed Service, what criterion should be included in the terms and conditions of the assignment of spectrum for satellite user links to avoid any interference to/from terrestrial networks? Please provide a detailed response alongwith international practice in this regard.**

**Response:**

In case the spectrum assigned to the satellite user link is also assigned to terrestrial networks such as Fixed Service, the criterion to be included in the terms and conditions of the assignment of spectrum for satellite user links to avoid any interference to/from terrestrial networks, would **depend on the type of UT.**

- For **fixed UTs**, a **'protection distance'** may be proposed around a terrestrial link, where no fixed UTs can be installed. Such protection distance is usually in the order of a few kilometers.

In addition, a **'coordination distance'** may also be prescribed, wherein coordination would be required between the two services.

- For **land mobility UTs**, **co-frequency is usually avoided**, as it is difficult to coordinate as the UTs are moving around.
- For **aero and maritime UTs**, **PFD limits may be prescribed**, in case the same spectrum is assigned to terrestrial networks, such as Fixed Service, as well.

For instance, the European (licensing) Decision ECC (18)05 for the Ku-band FSS allocation to NGSO systems, provides for a Max EIRP of the satellite terminal of 54.5 dBW. Further, its Annex 1 provides for PFD limits for all earth stations on moving platforms (land, aero and maritime). Such PFD limits protect the terrestrial microwave links from co-frequency and co-located operations.

**Q9. Whether there is a need to prescribe any conditions to mitigate the risk of scarcity of satellite gateway sites? If yes, please provide a detailed response alongwith international practice in this regard.**

**Response:**

We do not believe that there is a need to develop or propose regulations to mitigate such risk. To our knowledge, there is no such practice in other countries. Gateway earth stations are usually with directive antennas, and easy to share spectrum with other users.

**Q10. In addition to the roll-out conditions recommended by TRAI for satellite-based Telecommunication Service Authorisation through its recommendations on the Framework for Service Authorisations to be Granted Under the Telecommunications Act, 2023 dated 18.09.2024, whether there is a need to impose certain additional roll-out obligations for the assignment of frequency spectrum for –**

- (a) NGSO based Fixed Satellite Services for providing data communication and Internet services;**
- (b) GSO/NGSO based Mobile Satellite Services for providing voice, text, data, and Internet services?**

**Please provide a detailed response alongwith international practice in this regard.**

**Response:**

We do not believe that there should be any of such constraints to be imposed on satellite earth station operators. To our knowledge, there is no such practice in other countries. Gateway Earth stations are usually with directive antennas, and easy to share spectrum with other users.

Further, the very nature of satellite services implies that the services would be available ubiquitously across the globe, and hence, the requirement of coverage-related rollout would always be possible to be met by NGSO & GSO satellites.

**Q11. Whether there is a need to introduce a provision for surrender of frequency spectrum prior to the expiry of the period of validity of spectrum assigned for –**

- (a) NGSO based Fixed Satellite Services for providing data communication and Internet services;**
- (b) GSO/NGSO based Mobile Satellite Services for providing voice, text, data, and Internet services?**

**If yes, what should be the process, and associated terms and conditions such as minimum period of spectrum holding, notice period, surrender fee, etc.? Please provide a detailed response with justifications.**

**Response:**

In principle, licensees should be able to surrender their radio frequency rights prior to the expiry of the validity period of the assignment, if they have terminated operations and do not need it. In such cases, the company is reimbursed of the fees paid proportionate to the remaining period.

**Q12. Whether there is a need to prescribe timelines for processing the applications for the assignment of frequency spectrum for –**

- (a) NGSO based Fixed Satellite Services for providing data communication and Internet services;**
- (b) GSO/NGSO based Mobile Satellite Services for providing voice, text, data, and Internet services?**

**Please provide a detailed response with justifications.**

**Response:**

Yes, having a statutory timeframe for the processing of frequency assignment applications is important to provide regulatory certainty to service providers. Usually, regulators in other countries have a 30 to 60 days' timeframe to either grant the frequency assignment or reject it.

The timeline should begin to run upon receipt of a duly completed application form and payment of the application fee, if any. If required, the regulator should allow the operator to discuss and/or clarify the details of the application in person, and should also allow minor modifications before the expiry of the said statutory timeframe. Further, in case of a rejection, the regulator should provide detailed reasons as to why the application is rejected.

**Q13. Whether there are any other suggestions related to assignment of spectrum for –**

- (a) NGSO based Fixed Satellite Services for providing data communication and Internet services;**
- (b) GSO/NGSO based Mobile Satellite Services for providing voice, text, data, and Internet services?**

**Please provide a detailed response with justifications.**

**Response:**

While we have provided our inputs regarding various terms and conditions of spectrum assignment for SatCom services in our responses to the questions above, we wish to make the following submissions regarding simplification of the process of spectrum assignment and improving ease of doing business with respect to the SatCom sector:



**(i) Requirement of In-Principle Clearance from Inter-Ministerial Committee for SatCom Networks**

As part of the 2022 SatCom reforms, the Government took several very welcome steps with regard to satellite-based services like the removal of MPVT charges and scope enhancement of Commercial VSAT. However, the sector still yearns for more crucial reforms to be initiated such as doing away with the requirement of in-principle clearance of Inter-Ministerial Committee – Satellite Network Clearance (IMC-SNC) for various activities.

Even after obtaining the license/authorisation, the satellite operator is still required to obtain in-principle clearance from IMC-SNC for the following activities:

- Establishing any satellite-based communication network.
- Starting totally new service/network or change in the service/network.
- Use of new technology for the first time, change of technology.
- Setting up of additional hub/gateway station.
- Change of frequency band.
- Any proposal not exactly similar to a previously cleared proposal or not scrutinised and approved by the IMC-SNC for any other licensee.

We believe that these requirements are archaic, not in sync with liberalised times for the sector, serve no purpose and, hence, should be done away with.

Moreover, there is no corresponding requirement of obtaining such a clearance from an Inter-Ministerial Committee, not even in the case of the vast terrestrial networks deployed across India that provide services to over a billion customers, operate millions of BTSs, operate in multiple spectrum bands (e.g. 700MHz/900MHz/1800MHz/2.1GHz/2.3GHz/2.5GHz/3.3GHz/26GHz) and multiple technologies (2G/3G/4G/5G) and manage interference with other operators at circle levels, with unlicensed operators and various government users.

As SatCom will remain a very niche segment relative to terrestrial, there is no point in continuing with such onerous requirements for SatCom. This reform will boost investor confidence, simplify the procedure and still meet the objectives of the Government, without impacting the precious time to launch service.

**Therefore, we recommend that the requirement of in-principle clearance of IMC-SNC for establishing/modifying satellite-based communication networks should be done away with.**

**(ii) Requirement of a Carrier Plan Approval from NOCC for SatCom**

Currently, a SatCom operator is required to obtain a carrier plan approval from NOCC.

We understand that this requirement flows from GSO-based networks, where the same satellite is shared among multiple operators, thus necessitating interference monitoring by NOCC.

However, in the case of NGSO, the whole constellation serves only one entity, which is the satellite operator itself. Hence, there is no case for interference monitoring by a third party.

Even interference with adjacent satellites is a non-issue, as ITU already has well-defined processes for coordination among different satellite systems, with which all satellite operators have to mandatorily comply.

In case it is still felt that the submission of information regarding carrier plans, antenna parameters, etc. is necessary, NGSO operators could continue to provide the same on the Saral Sanchar portal on a self-intimation basis – rather than having to seek an approval.

**Therefore, we recommend that the requirement of carrier plan approval from NOCC for SatCom services should be done away with and replaced with a simple intimation-based process.**

**Q14. Should spectrum charges for NGSO-based FSS providing data communication and Internet services, be levied:**

- i. On a per MHz basis,**
- ii. On a percentage of Adjusted Gross Revenue (AGR) basis, or**
- iii. Through some other methodology?**

**Please provide a detailed justification for your answer.**

**Q15. In case it is decided that spectrum charges for NGSO-based FSS providing data communication and Internet services should be levied on a per MHz basis, should these charges be calculated based on:**

- i. The Department of Telecommunications (DoT) order dated December 11, 2023, or**
- ii. An alternative approach (please specify)?**

**Please provide a detailed justification to support your answer.**

**Q16. If it is decided that spectrum charges for NGSO-based FSS providing data communication and Internet services should be levied on a percentage of AGR basis:**

- i. What should be the appropriate percentage of AGR?**
- ii. Should a minimum spectrum charge be specified to address the issue of inefficient utilization of spectrum? If yes, what methodology may be used to determine the amount of the minimum spectrum charge?**

- iii. Is there an alternative approach that could be followed to address the issue of inefficient spectrum utilization?

Please provide a detailed justification for your answers.

- Q17.** Considering the Adjusted Gross Revenue (AGR) based charging methodology currently followed for Commercial VSAT and in view of the enhanced scope of the Satellite service authorisation, what should be the spectrum charge, as a percentage of AGR, that should be levied on GSO-based FSS? Or, Should some alternative spectrum charging methodology be used for determining spectrum charges for GSO-based FSS?

Please provide a detailed justification for your answer.

- Q18.** Should spectrum charges for GSO and NGSO-based MSS that provide voice, text, data, and Internet services be levied:

- i. On a per MHz basis,
- ii. On a percentage of AGR basis, or
- iii. Through some other methodology?

Please provide a detailed justification for your answer.

- Q19.** If it is determined that spectrum charges for GSO/NGSO-based MSS providing voice, text, data, and Internet services should be levied on a per MHz basis, should these charges be calculated based on:

- i. The Department of Telecommunications (DoT) order dated December 11, 2023, or
- ii. An alternative approach (please specify)?

Please provide a detailed justification to support your answer.

- Q20.** If it is decided that spectrum charges for GSO/NGSO-based MSS providing voice, text, data, and Internet services should be levied on a percentage of AGR basis:

- i. What should be the appropriate percentage?
- ii. Should a minimum spectrum charge be specified to address the issue of inefficient utilization of spectrum? If yes, what methodology may be used to determine the amount of the minimum spectrum charge?
- iii. Is there an alternative approach that could be followed to address the issue of inefficient spectrum utilization?

Please provide a detailed justification for your answers.

- Q21.** Whether there are any other issues/suggestions relevant to the spectrum charging for:

- i. NGSO/GSO based FSS providing data communication and Internet services.

**ii. NGSO/GSO based MSS providing voice, text, data, and Internet services.**

**The response may be submitted with proper explanation and justification.**

**Response:**

We submit that there should be no charge for downlink frequencies. Only the uplink frequencies should be charged for, and even then, the charges should be waived to the extent that they are operated on a non-protection basis. Further, a nominal fee may be charged only for the recovery of costs of administration. However, we have also provided some alternative approaches for the Authority's consideration. Please see our detailed submissions below:

**International Best Practices:**

It is observed from an analysis of international best practices, that most jurisdictions charge a nominal fixed fee for the use of spectrum to recover only the administrative expenses. Further, it is only the uplink frequencies (Earth-to-space) which are charged for; no charge is applicable in case of downlink frequencies (space-to-Earth) as they are operated on a non-protection basis. We provide a few examples below:

**Examples of Charging for User Links:**

- a. New Zealand: Spectrum use by NGSO systems is under the GURL regime, which means that spectrum use and satellite terminals are licence exempted. This is because the terminals and satellite operations do not provide any interference to New Zealand's services (there are no terrestrial services in 14-14.5 GHz; while the 10.7-12.75 GHz is allowed on a non-protected basis).<sup>1</sup>
- b. Australia: Spectrum use is based on a "Space Licence" issued to the respective satellite operator, for the whole of Australia. While there is no application fees, the license involves an annual fee of USD 35,000 and USD 70,000, for the frequency ranges 14.0-14.5 GHz and 10.70-12.75 GHz respectively.

Further, UTs are deemed to be under a "Class 1" licence regime, which means that they are exempt from both the individual licence and their spectrum use. This is because NGSO UTs are deemed to not cause any interference to terrestrial services in the 14.0-14.5 GHz band, and operate on a "non-protected" basis in the 10.7-12.75 GHz band.

- c. Japan: The fee for spectrum licence for all NGSO services in Ku-band is the equivalent of around USD 650 per year, independent of bandwidth.
- d. Columbia: The annual fee for the use of radio spectrum associated with a permit for a group of low-power earth stations with similar operating characteristics and for a moving earth station (ESIM) permit on board aircraft, vessels or ground vehicles, is

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<sup>1</sup> <https://www.rsm.govt.nz/licensing/frequencies-for-anyone/satellite-services-gurl>

calculated using the following formula: Fees for a group of earth stations with similar technical characteristics = 6.72 x P, where P is the base price factor (equal to approximately COP 1,008,148.93 or USD 240).

- e. Europe: 34 countries in Europe, including Sweden, Norway, Finland, Italy, Slovenia, Denmark, Poland, Czech Republic, Slovak Republic, Serbia, Estonia, etc., have issued a “general authorization”, i.e., a statutory instrument that exempts the NGSO services from holding a spectrum licence and paying a fee for spectrum use – based on the ECC Decision (17)04<sup>2</sup> for fixed terminals of NGSO systems and ECC Decision (18)05<sup>3</sup> for mobility terminals of NGSO systems operating in the 14.0-14.5 GHz and 10.7-12.75 GHz.

Further, in Europe, all aero and maritime terminals, which are compliant to the ECC Decision (18)05, are exempted from a spectrum licence.

Furthermore, there are some other European countries which charge for only the uplink frequencies for user link, as the downlink frequencies are assigned and used on a non-protection basis. Some such examples are discussed in subsequent paras.

- f. Germany: Network spectrum licence is based on the formula: fees = 3.50 x t x B x NU, where t = 1 year, B = bandwidth (in MHz), and NU = type of use (1 in case of stationary use only, and 3 in case of both stationary and mobile use).

In the case of use of the entire 14.0-14.5 GHz band for FSS, this formula amounts to the fees being € 1750 for stationary use only, and € 4750 for both stationary and mobile use cases.

- g. Romania: A flat spectrum licence fees at €3500 per year is applicable in case of all satellite applications.

- h. UK: A flat fee of £200 is applicable in case of all satellite applications.<sup>4</sup>

- i. Switzerland: The fees for the Satellite Network is calculated by multiplying the basic frequency price (BFP) by the frequency range factor (FRF), the bandwidth factor (BF) and the frequency class factor (FCF), i.e., Fee (Satellite Network) = BFP x FRF x BF x FCF,<sup>5</sup> where:

- BFP = CHF 15
- FRF is determined by the following table:

Band	FRF
Less than 1 GHz	1.2
1 to less than 3 GHz	1.7

<sup>2</sup> <https://docdb.cept.org/download/4208>

<sup>3</sup> <https://docdb.cept.org/download/3536>

<sup>4</sup> <https://www.ofcom.org.uk/siteassets/resources/documents/manage-your-licence/satellite-earth-stations/guidance/ngso-guidance.pdf?v=327285>

<sup>5</sup> <https://www.fedlex.admin.ch/eli/cc/2020/1028/de>

3 to less than 15 GHz	1.1
15 to less than 40 GHz	1.4
40 GHz and above	1.0

- BF is calculated by dividing the allocated bandwidth by 1 MHz
- FCF is determined as follows:
  - If the bandwidth is allocated to a single satellite network, FCF = 1
  - If the bandwidth is allocated to several satellite networks or is used together with terrestrial radio uses, FCF = 0.2

In case of use of entire FSS allocations in 10.7-12.75 GHz and 14.0-14.5 GHz, BFP = 15, FRF = 1.1, BF = (2050 + 500)/1 MHz = 2550, FCF = 0.2 (as the band is shared with other networks), resulting in a Satellite Network Fee of 15 x 1.1 x 2550 x 0.2 = CHF 8,415 per year.

In addition, a fee is levied for the management and technical control of the frequency spectrum and orbital positions of satellites, at the rate of CHF 36 per allocated bandwidth of 4 MHz per year. For the use of entire FSS allocations in 10.7-12.75 GHz and 14.0-14.5 GHz, this formula results in a Spectrum Management Fee of 36 x (2550/4) = CHF 22,950 per year.

Hence, the total fees for use of the whole Ku-band FSS spectrum in Switzerland comes out to CHF 31,365 per year.

#### Examples of Charging for Feeder Links:

- a. Sweden: The fees for the use of the whole Ka-band spectrum comes out to be about € 9000 per year.
- b. Bulgaria: While there are no charges for downlink frequencies, the following charges apply in case of uplink frequencies:<sup>6</sup>
  - A one-time fee of BGN 80 (1 BGN= USD 0.56) according to Bulgarian law<sup>7</sup>
  - A one-time administrative fee of BGN 800 per station<sup>8</sup>
  - An annual fee equal to:
    - BGN 200 per MHz for bands below 18.4 GHz for each station<sup>9</sup>
    - BGN 10 per MHz for bands above 18.4 GHz for each station<sup>10</sup>

Thus, a gateway station in Bulgaria with 10 antennas of same characteristics, using uplink frequencies from 27.5-29.0 and 29.5-30 GHz (i.e., 2,000 MHz), will accrue a fee of BGN 20880 (equivalent to USD 11,630) per year.

<sup>6</sup> [https://crc.bg/files/URChS/RChS/FrequencyPlan2023\\_EN.pdf](https://crc.bg/files/URChS/RChS/FrequencyPlan2023_EN.pdf)

<sup>7</sup> See Art. 9, (1), 6 of the CRC Tariff Code

<sup>8</sup> See Art. 2, (1), 3 of the CRC Tariff Code

<sup>9</sup> See Art. 7, (1), 1.1 of the CRC Tariff Code

<sup>10</sup> See Art. 7, (1), 1.2 of the CRC Tariff Code

- c. UK: The fee for feeder-link is based on the following formula with the corresponding coefficients:<sup>11</sup>

**Satellite (Permanent Earth Station) licence fees**

For each site (the area contained within a circle of a radius of 500 metres centred on a point defined by the licensee), the appropriate annual sum is calculated in accordance with the following formula.

$$AS = \sum_{bands} \left[ 28 \times BF_{band} \times \sqrt{\sum_{paths_{band}} (P_{path} \times BW_{path})} \right]$$

where -

“AS” means the appropriate annual sum in pounds sterling;

“bands” mean the numbers listed in Column 1 of Table 1, corresponding to the range of frequency band listed in Column 2 of that table which are authorised by the licence;

“BF<sub>band</sub>” means the band factor applying to each band, being the number in Column 3 of Table 1 corresponding to the band listed in Column 1 of the same table;

“paths<sub>band</sub>” means the set of those transmission paths authorised by the licence for which the authorised transmission frequency lies within the frequency range of each band as set out in Column 2 of Table 1;

“P<sub>path</sub>” means the authorised peak transmit power (in Watts) at the flange of the antenna of the earth station for each transmission path;

“BW<sub>path</sub>” means the authorised transmit bandwidth (in MHz) for each transmission path; and

“transmission path” means a combination of a satellite earth station transmitter, a satellite receiver, a transmission frequency, and polarisation for which transmissions are authorised by the licence.

The table of coefficients is as below:

Column 1: band	Column 2: Range of frequency band ( <i>fb</i> ) (in GHz)	Column 3: Band factor
1	$fb < 5$	2.33
2	$5 \leq fb < 10$	1.72
3	$10 \leq fb < 16$	1.00
4	$16 \leq fb < 24$	0.70
5	$fb \geq 24$	0.60

**Suggested Approach based on International Best Practices:**

Similar to examples given above, we recommend that **there should be no charge for downlink frequencies. Only the uplink frequencies should be charged for, and even then, the charges should be waived to the extent that they are operated on a non-protection basis. Further, a nominal fee may be charged only for the recovery of costs of administration – which may either be a flat fee or calculated based on the hourly rate and the hours put in for the grant of the frequency assignment.**

In case of a flat fee, it may depend on either the frequency band or the number of UTs deployed.

- An indicative approach for flat fee depending on the frequency band is provided below:

Band	Flat fee per network
Less than 1 GHz	INR 32,000

<sup>11</sup> <https://www.ofcom.org.uk/siteassets/resources/documents/manage-your-licence/satellite-earth-stations/guidance/fees.pdf>

1 to less than 3 GHz	INR 100,000
3 to less than 10 GHz	INR 320,000
10 to less than 17 GHz	INR 1,000,000
Above 17 GHz	INR 3,200,000

- An indicative approach for flat fee depending on the number of UTs is provided below:

<b>Band</b>	<b>Flat fee per network</b>
1 to 10	INR 32,000
11 to 100	INR 80,000
101 to 1000	INR 160,000
1001 to 20,000	INR 1,000,000
20,001 to 100,000	INR 5,000,000
Above 100,000	INR 20,000,000

Price differences may also apply depending on the following factors:

- Bandwidth used per terminal
- Shareability of the frequency allocation used – MSS allocations are usually difficult to share, whereas FSS allocations are easier to share with other satellite operators and other services.

For instance, the fees for L/S bands, where spectrum is scarce due to non-shareability, should be higher than Ku-band, where the spectrum is highly shareable among multiple operators.

A “coefficient value” may be introduced to consider these aspects, so that the spectrum charges are a function of all the above factors.

### **Alternative Approaches:**

While we recommend a spectrum charging in the form of a nominal fixed fee to recover only the administrative expenses, we recognize that there are alternative approaches – per-MHz charging or revenue-share basis – available for consideration. In case such alternative approaches are adopted, we make the following submissions:

#### **Per-MHz Charging:**

At the outset, we clarify that we do not support charging based on bandwidth for NGSO systems because systems using frequencies above 10 GHz would be disadvantaged due to the following reasons:

##### *1. Spectrum can be shared easily:*

- Spectrum can be easily shared among NGSO systems, using ITU-RR Article 9 frequency coordination.



- Spectrum can be easily shared with GSO systems, through the use of EIRP limits, and/or frequency coordination basis (Article 9 of the ITU-RR).
2. *Satellite terminals do not cause interference to other services, due to, inter-alia, relatively low EIRP (< 50 dBW) and highly directive antennas:*
    - For instance, in Europe, when electronic communication equipment is not deemed to cause interference then these are exempted from licensing. This is assured in several ways:
      - The equipment has been homologated to an ETSI Standard, e.g., EN 303 380 for equipment operating in the NGSO systems of 14.0-14.5 GHz.
      - The equipment is compliant to a given ECC Decision for NGSO systems, e.g., ECC Decision (17)04 for Ku-band Fixed terminals and ECC Decision (18)04 for Ku-band mobility terminals.
  3. *Satellite terminals are allowed to operate on a non-interference and non-protected basis:*
    - Satellite terminals reception (10.7-12.75 GHz) is usually not protected from interference from terrestrial systems (such as microwave links).
    - Satellite terminals transmissions (14.0-14.5 GHz) for land based terminals usually are not allowed to operate in bands where terrestrial usage (such as microwave links) is present, thus operating on a non-interference basis.
    - Satellite terminals transmissions (14.0-14.5 GHz) for aero and maritime terminals operate with a PFD limit to protect terrestrial systems (such as microwave links).
  4. *Satellite terminals use small bandwidth which is also shared in the same beam amongst 1000's of other satellite terminals distributed geographically.*
    - Individual satellite terminals use small amount of bandwidth, and such bandwidth is shared with 100's, or even 1000's of other satellite terminals at the same carrier frequency.
  5. *Satellite fees using Bandwidth formula only may result in excessive and unsustainable spectrum fees for the business, which then would have to be passed on to consumers, thus failing the need to provide affordable services.*

Accordingly, we believe that the extant per-MHz charging as per DoT's order dated 11<sup>th</sup> December 2023 is not appropriate for the NGSO systems which provide broadband connectivity and may use the whole spectrum allocated to the service.

This is because the extant approach indiscriminately applies the basic rate of INR 35,000 across all satellite allocations from, say, 1 MHz to 100 GHz. This approach neither differentiates between satellite systems and their architecture, nor does it account for the shareability of the spectrum between satellite systems.

This will lead to extremely high fees for certain types of systems, especially for broadband systems in Ku/Ka bands, while keeping the others like those in L/S bands affordable. Such an approach will lead to unnecessary high fees for the NGSO systems, whose architecture is designed to deal with capacity and data volumes, rather than spectrum use.

This approach unfairly treats all systems the same, while they are not. The table below provides a comparison of different system requirements.

Allocation	Shared spectrum	Typical bandwidth per terminal	Number of Satellite Systems sharing a given block
1-3 GHz	Not easy to share	20 to 200 kHz	1 to 2 GSO or NGSO
3-9 GHz	Easy to share and coordinate	5 to 18 MHz	10s GSO and NGSO
10 to 18 GHz	Very easy to share and coordinate	18 to 250 MHz	100s GSO and NGSO
18 to 30 GHz	Very easy to share and coordinate.	250 to 2000 MHz	500s GSO and NGSO

Many countries (like UK, Switzerland, etc.) differentiate between allocations, for example MSS allocation in 1.5/1.6 GHz versus FSS allocation in 11/14 GHz, using a Frequency Factor. The MSS frequencies are considered difficult to share and, in many cases, are assigned in separate blocks to users; and thus, a higher factor is assigned. On the other hand, for the FSS spectrum allocations in Ku/Ka bands, such factor is much lower, as the spectrum is easily shared.

Hence, using INR 35,000 per basic block of 0.5 MHz may be appropriate for MSS allocations in L/S bands, but not for FSS/MSS allocations in Ku/Ka bands – where a larger reference bandwidth should be considered, say 10 MHz. This would yield a reasonable pricing of spectrum for FSS/MSS/BSS allocations above 4 GHz.

Therefore, in case per-MHz charging is adopted, as an indicative approach, we propose the following table to assign (i) a reference bandwidth (Bs) and (ii) a reference price (Ps) per reference bandwidth, and some examples for calculating spectrum charges based on the same:

Frequency Range	Unit Pricing (INR)	Unit Bandwidth (MHz)
Below 2.2 GHz	35,000	0.5
Between 2.2 to 3.6 GHz	35,000	1
Between 3.6 to 6.4 GHz	30,000	2.5
Between 6.4 to 8.5 GHz	30,000	5
Between 8.5 to 10 GHz	30,000	10
Between 10 to 17.7 GHz	25,000	25
Above 17.7 GHz	25,000	50

*Example 1: MSS allocation in 1.5/1.6 GHz*

Bandwidth used = 5 MHz (typical transponder channel)  
Spectrum Charges = (35,000 / 0.5 MHz) x 5 MHz = INR 350,000

*Example 2: FSS use in C-band (3.6/6.4 GHz)*

Bandwidth used = 32 MHz (minimum satellite transponder channel)  
Spectrum Charges = (30,000 / 2.5 MHz) x 36 MHz = INR 432,000

*Example 3: FSS use in Ku-band (10.7-14.5 GHz GHz)*

Bandwidth used = 1000 MHz (minimum satellite requirement for NGSO)  
Fees = (25,000 / 20MHz) x 1000 MHz = INR 1,000,000

*Example 4: FSS use in Ka-band (17.7-30 GHz)*

Bandwidth used = 3000 MHz (minimum satellite Earth station spectrum use for NGSO system)  
Fees = (25,000 / 50MHz) x 3000 MHz = INR 1,500,000

An additional factor to consider is the type or spectrum use, i.e. whether the spectrum is being used for retail consumer services, or for backhaul connectivity for bulk capacity sales. The following use factor could be used to further multiply with the spectrum charges as calculated above:

Type of spectrum use	Use Factor
Retail spectrum use	3
Backhaul or Gateway use	1

Revenue Share Basis:

Another alternative is to levy spectrum charges as a percentage of the revenue earned by an operator.

In case a revenue share based regime is adopted for SatCom spectrum charging, we suggest that nominal rates ranging between 0.1-0.2% may be levied.

**In summary, we recommend the following:**

- (i) There should be no charge for downlink frequencies. Only the uplink frequencies should be charged for, and even then, the charges should be waived to the extent that they are operated on a non-protection basis. Further, a nominal fee may be charged only for the recovery of costs of administration.**
- (ii) Notwithstanding, in case a per-MHz charging approach is adopted, it should account for differences in the different kinds of allocations, usage, shareability, etc. Further, in case revenue share regime is adopted, SUC may be levied at nominal rates ranging from 0.1-0.2%.**