

Prasar Bharati
(India's Public Service Broadcaster)
Prasar Bharati House, Copernicus Marg,
New Delhi-110001

No: P-1/013(59)/2019-Ops.


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Subject:- TRAI Consultation Paper on Auction of Spectrum in frequency bands identified for IMT/5G - Comments from Prasar Bharati regarding.

Reference: TRAI Consultation Paper No. 8/2021 dated 30.11.2021

In response to the Consultation Paper on "Auction of Spectrum in frequency bands identified for IMT/5G" by Telecom Regulatory Authority of India (TRAI) released on 30th November 2021, the comments from Prasar Bharati on various issues raised in the Consultation Paper are annexed.

2. This issues with the approval of CEO, Prasar Bharati.


(Prakash Veer)
DDG (Ops)

Shri S.T. Abbas, (advmn@trai.gov.in)
Advisor (Network, Spectrum & Licensing),
Telecom Regulatory Authority of India
Mahanagar Doorsanchar Bhawan,
Jawaharlal Nehru Marg,
New Delhi- 110 002

Copy to:

Shri Sanjiv Shankar, Joint Secretary (Broadcasting), Ministry of Information and Broadcasting, Shastri Bhavan, New Delhi – 110 001

Comments from Prasar Bharati on TRAI Consultation Paper on Auction of Spectrum in frequency bands identified for IMT/5G

Prasar Bharati, the country's Public Service Broadcaster is providing radio and television services in the country. In addition to conventional Radio and TV Broadcasting, Prasar Bharati has also engaged in ensuring its presence through multiple delivery platforms including Analog Terrestrial, Digital Terrestrial, Satellite, Streaming, DTH etc.

1.1 The consultation paper primarily pertains to issues related with Auction of Spectrum in frequency bands identified for IMT/5G. In this consultation paper, spectrum frequencies 526-698 MHz, 3300-3670 MHz and 24.25-28.5 GHz (mm Wave), are also proposed to be auctioned for the first time, in addition to the spectrum auctions in other bands which have been held earlier.

1.2 At present, the frequency band 526-582 MHz is being used by Doordarshan in Prasar Bharati for providing Terrestrial TV Broadcasting. Many Analogue, Digital Ready and Digital Terrestrial TV Transmitters are operating in the band. The old outdated Analogue Terrestrial TV (ATT) Transmitters are being rationalized/phased out for migration towards digital. Also Digital ready transmitters are under installation in Union Territory of Jammu & Kashmir for which the WPC has provided DL in this band only.

1.3 In addition, the allocation of 3300-3670 MHz for IMT will result in reduction of the guard band between IMT Services and C Band Satellite Services from existing about >80 MHz to 10 MHz only. Doordarshan is using C-band satellite services {uplink-5.925-6.425 GHz and downlink 3.7 - 4.2 GHz} for contribution and distribution of its channels, which are subsequently used by Cable operators(MCO/LCO)/DTH operators for mandatory carriage on their platforms, DD FreeDish DTH and DD Terrestrial Transmitters to reach the viewers.

1.4 Although, in case of DD, effective guard band /separation is 30 MHz, however, the exact impact on satellite services would need to be assessed by Department of Space.

2.0 The comments of Prasar Bharati with respect to the relevant questions under **Chapter-V**: Issues for consultation are as under:

Issues related to Quantum of Spectrum and Band Plan

Q.1. Whether spectrum bands in the frequency range 526-617 MHz, should be put to auction in the forthcoming auction? Kindly justify your response.

Ans. At present frequency band 526-582 MHz is being used by Prasar Bharati (DD) for providing Terrestrial TV Broadcasting. Many Analogue, Digital Ready and Digital Terrestrial TV Transmitters are operating in the band. The old outdated Analogue Terrestrial TV (ATT) Transmitters are being rationalized/phased out for migration towards digital. Also Digital ready transmitters are under installation in UT of J&K for which the WPC has provided DL in this band only.

In view of above whole frequency band 526-617 MHz band should not be put for auction in forthcoming auction unless the existing services and future plans of Prasar Bharati (DD) are taken care of.

Justification for this is provided in **Annexure-I**

Q.2. If your answer to Q1 above is in affirmative, which band plans and duplexing configuration should be adopted in India? Kindly justify your response.

Ans. Not applicable.

Q3. In case your answer to Q1 is in negative, what should be the timelines for adoption of these bands for IMT? Suggestions to make these bands ready for adoption for IMT may also be made along with proper justification.

Ans. In view of position explained in point no 1, frequency band 526-617 MHz band should not be put for auction in forthcoming auction unless the existing services and future plans of Prasar Bharati (DD) are taken care of.

The timeline for adoption of these bands for IMT would depend of meeting out the following conditions :

- i. The requirements of Terrestrial TV services in the frequency band 470-582 MHz are finalized.
- ii. Co-ordination for having enabling clause of identification of suitable band below 698 MHz for IMT in India is completed.
- iii. The process of identifying globally harmonized band for IMT below 698 MHz by ITU is completed.

Justification is provided in **Annexure-I**

Q5. For 3300-3670 MHz frequency range, which band plan should be adopted in India? Kindly justify your response.

Ans. The issue related with frequency range 3300MHz.-3670MHz.may have to be addressed by DoS in detail as the guard band between C band Satellite services and IMT has been reduced.

Also allocation of 3300-3670 MHz for IMT will result in reduction of the guard band between IMT Services and C Band Satellite Services from existing about 100 MHz to 30 MHz only. The issue related with likely interference consequent to reduction in the guard band may have to be addressed by DoS in detail.

C Band Satellite downlink being used by PB(DD) for Networking and Distribution Any interference from IMT will also affect the C Band Satellite Downlink reception by the receiving ends be it DD Centers, DD DTH, Other DTH Operators/MSOs/LCOs who are using the C Bank Downlink of DD Services for mandatory carriage on their platforms

Q8. Whether entire available spectrum referred by DoT in each band should be put to auction in the forthcoming auction? Kindly justify your response.

Ans. As stated in response to Q No 1 & 5, issues related with those band may preferably be resolved before auctioning those bands.

Issues related to Block Size

Q11. In case it is decided to put to auction spectrum in 526-698 MHz bands, what should be the optimal block size and minimum quantity for bidding? Kindly justify your response.

Ans. As stated in response to Q No 1 & 8 issues related with the band may preferably be resolved before auctioning this band.

Q12. What should be optimal block size and minimum quantity for bidding in 3300-3670 MHz band? Kindly justify your response.

Ans. As stated in response to Q No 5 & 8 issues related with the band may preferably be resolved before auctioning this band.

Issues related to Interference mitigation in TDD bands

Q16. Is there a need to prescribe any measure to mitigate possible interference issues in 3300-3670 MHz and 24.25-28.5 GHz TDD bands or it should be left to the TSPs to manage the interference by mutual coordination and provisioning of guard bands? Kindly provide justification to your response.

Ans. Yes. Detailed justifications are provided in **Annexure-II**

Consultation with DoS, DD and existing users of the C Band satellite services (in lower edge of C Band) may be needed to ensure protection of existing services.

Issues related to Roll-out Obligations

Q19. What should be associated roll-out obligations for the allocation of spectrum in 526-698 MHz frequency bands? Should it be focused to enhance rural coverage? Kindly justify your response.

Ans. As stated in response to Q Nos. 1 & 8 issues related with the band may preferably be resolved before auctioning this band.

Q20. What should be associated roll-out obligations for the allocation of spectrum in 3300-3670 MHz frequency band? Kindly justify your response.

Ans. As stated in response to Q No 5 & 8 issues related with the band may preferably be resolved before auctioning this band.

Issues related to Valuation and Reserve price of Spectrum

Q46. In your opinion, what could be the possible reasons for the relative lack of interest for the spectrum in the 700 MHz band? Could this be attributed to technological reason(s) such as development of network/device ecosystem or availability of substitute spectrum bands or any other reasons(s)?

Ans. No comments for 700 MHz band. However going by this experience, it doesn't seem prudent to go for 600 MHz band auction at this stage.

Q50. In case you are of the opinion that frequencies in the range 526-698 MHz should be put to auction in the forthcoming spectrum auction, whether the value of 526-698 MHz be derived by using technical efficiency factor? If yes, with which spectrum band, should this band be related and what efficiency factor or formula should be used? Please justify your suggestions.

Ans. Not applicable

Justification with respect to Reply to Question Nos. 1 and 3:

I. Doordarshan's Requirements for Terrestrial TV Broadcasting

Frequency band 470-526-584 MHz is currently being used by Doordarshan for providing terrestrial TV broadcasting using its Analog and Digital Transmitters. Digitalization of Doordarshan's TV Transmitters is still underway and will take some time to complete it. As a Public Service Broadcaster, Prasar Bharati have been following the approach for adopting latest State of Art proven technologies. Prasar Bharati has signed an MoU with IIT Kanpur for collaborative activities in various areas including Direct to Mobile Broadcasting (DTM), Convergence with 5G, AI etc. Further roadmap for DTT would be finalized by Prasar Bharati on the basis of outcome of Proof of Concept (PoC) for Next Generation Technologies being carried out by IIT Kanpur. The quantum of spectrum required for DTT services will primarily depend on appropriate DTT architecture (MFN/SFN/Hybrid) to be used for the future DTT expansion as well as number of DTT Transmitters to be included in the DTT multiplex to be planned at different locations in the service area. Availability of spectrum is very crucial for planning DD TV Transmitters. It is appropriate to mention that DD had planned the transmitters of Uri, and Himbotingla in the lower spectrum band i.e under 526 MHz applied accordingly for DL, but WPC has allocated frequencies in upper bands for these transmitters on account of unavailability of spectrum in the lower band due to strategic usage. Thus, the decision to use Frequency Band 470-698 for IMT purpose can be taken only after finalization of Terrestrial TV Services by Doordarshan or other Private Broadcasters, as recommended by the TRAI vide their Recommendations on Issues related to Digital Terrestrial Broadcasting in India, January 31, 2017.

II. Review of Spectrum Requirement for IMT Services:

It is also to mention that availability of spectrum for IMT services is more than the requirement. Which is evident from the outcome of the previous auction (March-2021) which is summarised at section 3.10 (page 68) of current CP and reproduced below: It can be seen that huge chunk of 67% of available spectrum was unsold. In addition, new bands are also added in this auction -- 3300-3670 MHz (370 MHz in each LSA); 24.25 -28.5 GHz (3.75 GHz in each LSA). Clearly, supply is much above the demand.

III. Regulatory Considerations

1. It is very important to take present International regulatory provisions into account and National regulations has to be in line with the Regulations and Procedures mentioned

in Radio Regulation. Para 1.2 of Introduction of NFAP-2018 refers the same and re-iterated below for reference:

1.2 The Radio Regulations, an international treaty signed by India and other Member States of the International Telecommunication Union (ITU), governs the use of radio-frequency spectrum and satellite-orbits (geostationary and non-geostationary) at the global level. Accordingly, the Radio Regulations (Edition of 2016) is the foundational text used for drawing up the National Frequency Allocation Plan 2018 (NFAP-18).

2. There is no such recommendation/report from ITU which recommends the entire UHF band to be considered as IMT/5G band as mentioned in the consultation paper (please refer section 2.5 of current CP – “While ITU has identified spectrum in 470-698 MHz as an IMT band in Region 2 & Region 3,”). Currently, 700 MHz band, 800 MHz band and 900 MHz band are considered as IMT bands. Even 700 MHz band is not an IMT band in Region-1 and yet to be made a harmonized IMT band at global level. Only a very few countries have identified 600 MHz band (610/614 MHz – 698 MHz) as IMT band, as indicated in the Footnotes 5.296A & 5.308A of Radio Regulation -2020 and re-iterated below for reference:

5.296A In Micronesia, the Solomon Islands, Tuvalu and Vanuatu, the frequency band 470-698 MHz, or portions thereof, and in Bangladesh, Maldives and New Zealand, the frequency band 610-698 MHz, or portions thereof, are identified for use by these administrations wishing to implement International Mobile Telecommunications (IMT) – see Resolution 224 (Rev.WRC-19). This identification does not preclude the use of these frequency bands by any application of the services to which they are allocated and does not establish priority in the Radio Regulations. The mobile allocation in this frequency band shall not be used for IMT systems unless subject to agreement obtained under No. 9.21 and shall not cause harmful interference to, or claim protection from, the broadcasting service of neighbouring countries. Nos. 5.43 and 5.43A apply. (WRC-19)

5.308A In the Bahamas, Barbados, Belize, Canada, Colombia, the United States, Guatemala and Mexico, the frequency band 614-698 MHz, or portions thereof, is identified for International Mobile Telecommunications (IMT) – see Resolution 224 (Rev.WRC-19). This identification does not preclude the use of these frequency bands by any application of the services to which they are allocated and does not establish priority in the Radio Regulations. Mobile service stations of the IMT system within the frequency band are subject to agreement obtained under No. 9.21 and shall not cause harmful interference to, or claim

protection from, the broadcasting service of neighboring countries. Nos. 5.43 and 5.43A apply. (WRC-19)

3. It is also evident from the section 2.5 of current CP --- "On examination of the band plans defined by 3GPP, it appears that no band plans have been defined so far for 526-582 MHz and 582-617 MHz bands. Thus, ecosystem for IMT is not available in these bands." The main reason for non-availability of Ecosystem including band plan is that IMT Industry is not considering this 526-582-617 MHz band for IMT. Therefore, there is no move at ITU level for consideration of this band for IMT.

As WRC-23 is going to review regulatory provisions for IMT, based on already approved Agenda, ITU may be approached for coordination to get possible favorable enabling regulatory provisions to use the band 610-698 MHz for IMT. Review of allocations for the band below 610 MHz may be done after results of WRC-23 are known and shall be made in-line with outcome of WRC-23. Till that time the band 470-582 MHz shall be made available for Broadcasting Services only and auction of this band may be deferred till the finalization of global harmonized band for IMT below 698 MHz.

Justification with respect to Reply to Question no. 16:

- i. The guard band between IMT/5G and satellite services is being reduced from >80 MHz to 10 MHz only.
- ii. Doordarshan is using C-band satellite services (uplink-5.925-6.425 GHz and **downlink 3.7 - 4.2 GHz**) for contribution and distribution of its channels, which are subsequently used by Cable operators(MCO/LCO), DTH operators, DD FreeDish DTH and DD Terrestrial Transmitters to reach the viewers.
- iii. Although, in case of DD, effective guard band /separation is 30 MHz, however, the exact impact on satellite services would need to be assessed by Department of Space.
- iv. Reduction of Guard Band is much likely to have impact on the adjacent Satellite services (FSS) band which need to be protected from out-of-band emission by IMT services in 3300-3670 MHz band(now planned for being implemented).
- v. Several studies show that when 5G and FSS operate in adjacent bands, interference to FSS receivers will occur. The two main cause of interference between IMT5G operations and FSS receive earth stations are (i) immense disparity in signal level between the terrestrially based 5G and the faint satellite signals being received from 36000 km above the equator space-based satellite (ii) Out of Band Emissions (OOBE) produced by 5G transmissions. **Tests have shown that either of these interference mechanisms can result in complete loss of the Satellite (FSS) signal.**
- vi. **Prior to allowing terrestrial mobile services, it is felt necessary, that rules are adopted to ensure protection of existing C-band FSS operations.**
- vii. Suggestive techniques to be adopted for managing interference from 5G to FSS Receiver/ Mitigation Technique are as below:
 - The 5G signal power at the input of an FSS earth station LNB can easily saturate the LNB and wipe-out the satellite signal. The best solution to mitigate the 5G interference is to insert a RF waveguide filter between the output of the antenna and the input of the LNB. This will filter out to a great extent the unwanted 5G signal from saturating the LNB. For the filter to operate properly it is necessary to have a guard band between the edge of the 5G transmission and the FSS transmission to provide the waveguide filter the necessary bandwidth to reject the 5G interference at the earth station.

- 5G terrestrial operators have a number of tools at their disposal to manage and reduce the aggregate OOB level from base stations and user equipment to acceptable levels. Some of the tools available for the MNO to reduce the OOB levels:
 - a. Use lower transmit power levels for the base station and user equipment.
 - b. Install better transmit OOB mask.
 - c. Use Multiple-Input Multiple-Output (MIMO) technology to null the radiation pattern in the direction of earth stations.
 - d. Deploy microcells near FSS earth stations which have lower transmit powers.
 - e. Force user equipment to roam to non-C-Band frequencies near FSS earth stations

- viii. These mitigation techniques can be deployed by the MNO across their entire network, in specific areas or on a case-by-case basis to ensure the no impact /interference to the adjacent C-band FSS operations.
