



Telecom Regulatory Authority of India



Recommendations

On

Auction of Spectrum in 700 MHz, 800 MHz, 900 MHz, 1800 MHz, 2100 MHz, 2300 MHz, 2500 MHz, 3300-3400 MHz, 3400-3600 MHz Bands

(Response to back reference dated 1st July 2019 received from Department of Telecommunications on TRAI's recommendations dated 1st August 2018)

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CHAPTER-I: INTRODUCTION

1. The Department of Telecommunications (DoT), through its letter dated 19th April 2017, informed that the Government is planning to auction the right to use of spectrum in 700 MHz, 800 MHz, 900 MHz, 1800 MHz, 2100 MHz, 2300 MHz, 2500 MHz, 3300-3400 MHz and 3400-3600 MHz bands in the next auction. Through the said letter, DoT also requested the Authority to provide its recommendations on applicable reserve price, quantum of spectrum to be auctioned and associated conditions for auction of spectrum in these bands for all service areas under the terms of clause 11(1)(a) of TRAI Act 1997 as amended.
2. After a detailed consultation process, the Authority submitted its recommendations on 1st August 2018 on “Auction of Spectrum in 700 MHz, 800 MHz, 900 MHz, 1800 MHz, 2100 MHz, 2300 MHz, 2500 MHz, 3300-3400 MHz, 3400-3600 MHz Bands”.
3. DoT, through its letter dated 1st July 2019 (**Annexure**), has informed that the above-mentioned TRAI recommendations dated 1st August 2018 have been considered by the Digital Communications Commission (DCC) and on some of the issues, a need to seek clarification/reconsidered recommendations is felt. Accordingly, some of the recommendations have been referred back to the Authority by DoT for clarification/reconsideration. The Authority’s earlier recommendations, the views of the DoT thereon, and the response of the Authority are given in Chapter II.

CHAPTER-II: PARAWISE RESPONSE

DoT in its back-reference dated 1st July 2019, while referring back some recommendations, has stated certain points and requested TRAI to examine the same.

The Authority has examined these points and its response is given below. The para-wise response on the referred back recommendations is given subsequently.

Points raised by DoT

- a) The goal of National Digital Communication Policy (NDCP) 2018 includes achieving digital empowerment and improved well being of the people of the country and one of the objectives of NDCP is to provide broadband for all. Thus, pricing of spectrum should facilitate inclusive and affordable 5G services to all sections of the population and society across the country.
- b) The demand for spectrum is likely to be subdued due to consolidation in the market as at present, there are effectively three private telecom service providers.
- c) The objective should be to sell entire spectrum which is put for auction rather than having a situation where large quantum of spectrum remains unsold.
- d) In so far as spectrum for 5G services is concerned, whether any lock in period at all should be prescribed in the interest of greater participation.
- e) The feasibility of conducting future auctions of spectrum on pan-India basis rather than existing 22 Licensed Service Area wise.

The following comments may also be seen while examining para (e) above:

- i. So far, all the spectrum auctions have been conducted on SMRA (Simultaneous Multiple Round Ascending Auction) format. It is "simultaneous" because all bands are auctioned simultaneously, and also spectrum in all LSAs is auctioned simultaneously. There is no restriction on bidders in making bids on pan-India basis in bands where spectrum is available in

all LSAs. Therefore, in any case, the option of pan-India bidding is open to all bidders.

- ii. TRAI makes reserve price recommendations LSA-wise since the license agreements are LSA-wise, and it is neither mandatory for any telecom service provider to have pan-India service licenses, or pan-India spectrum.
- iii. Further, there may be other entities apart from incumbent mobile service providers, like Internet Service Providers (ISPs), or new entrants who may like to acquire spectrum in some LSAs and not on pan-India basis. In case, spectrum is to be auctioned on pan-India basis then it may have the effect of
 - Restricting the number of prospective bidders; and
 - Encouraging only players with huge funds for spectrum acquisition, thereby being monopolistic in nature.
- iv. SMRA format provides the flexibility to bidders in an auction to switch from one LSA to another while bidding, as well as from one band to another. The bidders' preferences and valuations of spectrum during the course of auction could change depending upon ascending prices vis-a-vis their options for investment to meet spectrum/business requirements in each LSA. In this regard, stipulating a pan-India bid will make reserve price into a pan-India one (rather than LSA-wise) which may not be the requirement for many bidders.
- v. There are also cases where validity of spectrum assignments of incumbents may end in some LSAs and so it may be the case for those operators to bid in only those LSAs, rather than pan-India.

Response of TRAI

The telecom infrastructure in the country is largely based on the wireless technologies. The goals of Digital India for the proliferation of broadband have always been kept in view while the Authority makes recommendations. It is for this reason that the Authority has recommended that entire available spectrum should be put to auction in the forthcoming auction.

It may not be correct to assume that only the existing licensees will participate in the auction as stated in para (b) above. The auction is an open process and there is always a possibility of additional players participating in the process. In fact, a similar view has been expressed by DoT in para (e) (iii) above.

For the sale of spectrum in an auction, the bidders take various factors into consideration such as, company's vision, network need, price, number of competing participants in the auction, FDI policy, development of device eco-system etc. The Government's own marketing efforts will also have an impact on participation in auction. Therefore, no guarantee can be given about sale of all the spectrum put to auction, as it depends on various factors mentioned above.

As regards feasibility of conducting future auctions of spectrum on pan-India basis, DoT itself has pointed out the issues that could arise in conducting spectrum auction on pan-India basis. The Authority has nothing further to add in this regard.

Other issues mentioned in the covering letter have been addressed in the para-wise response of the Authority, in the relevant paragraphs.

PARA-WISE RESPONSE

1. Para No. 4.1(a) of TRAI Recommendations

Entire available spectrum should be put to auction in the forthcoming auction.

DoT's View

- (i) The Digital Communications Commission has accepted the recommendation of TRAI to put entire available spectrum to auction.
- (ii) Spectrum availability in various bands was made available to TRAI while seeking their recommendations vide DoT letters dated

19.04.2017 and 23.07.2018. Since then, more spectrum has become available for auction due to harmonization of spectrum in 900 MHz band and surrender of spectrum by some telecom service providers (TSPs) in certain other bands.

- (iii) On the lines of earlier recommendations dated 23.04.2012 of TRAI on auction of spectrum and decision of the Government thereon, administratively allocated spectrum in 800 MHz, 900 MHz, and 1800 MHz, bands may also be auctioned at least 18 months in advance to enable the winning bidders to be ready with deployment plan Accordingly, all the administratively allocated spectrum in 800 MHz, 900 MHz and 1800 MHz bands whose validity is going to expire by 31.12.2021 may be auctioned in the forthcoming auction, barring similar access spectrum allotted administratively to Bharat Sanchar Nigam Limited (BSNL) and Mahanagar Telephone Nigam Limited (MTNL) which may be required to be allotted to BSNL and MTNL on administrative basis at an appropriate price subject to approval of competent authority.
- (iv) Based on the above, LSA-wise total spectrum availability as on date across various bands for auction in the forthcoming auction is as given in Annexure-I.
- (v) TRAI is requested to provide the reserve price of spectrum available in all the LSAs in all the bands.

Response of TRAI

In its back reference, DoT has informed that more spectrum has become available due to harmonization of spectrum in 900 MHz band and surrender of spectrum by some TSPs in certain other bands. DoT has further informed that all the administratively allocated spectrum in 800 MHz, 900 MHz and 1800 MHz bands whose validity is going to expire by 31st December 2021 may be auctioned in the forthcoming auction, barring similar spectrum allotted to BSNL/MTNL. This is in consonance with the TRAI Recommendations dated 23.04.2012.

The Authority has already given its recommendations on the reserve prices for most of the LSAs for 700/800/900/1800/2100/2300/ 2500/3300-3600 MHz bands.

The methodology, assumptions and rationale underpinning the valuation process have already been elaborated by the Authority in its recommendations dated 1st August 2018. The reserve price for the bands in the LSAs where spectrum has subsequently become available, as brought out in the DoT's back reference, has now been indicated in Table 1 and Table 2 for 800 MHz and 900 MHz respectively.

In case, spectrum in those bands, whose validity is expiring by 31st December 2021, becomes available earlier due to any reason such as surrender, cancellation etc., such spectrum should be made available to the successful bidder immediately on its availability.

**Table 1: Recommended Reserve Price Per MHz (paired) in 800 MHz Band
(Rs. In Crore)**

S.No.	Name of the LSA	Category	Reserve Price (as calculated)	Recommended Reserve Price (Rounded off)
1	Assam	C	64.20	64
2	Jammu & Kashmir	C	14.79	15
3	North East	C	15.06	15

**Table 2: Recommended Reserve Price Per MHz (paired) in 900 MHz Band
(Rs. In Crore)**

S.No.	Name of the LSA	Category	Reserve Price (as calculated)	Recommended Reserve Price (Rounded off)
1	Delhi	Metro	584.51	585
2	Mumbai	Metro	691.24	691
3	Kolkata	Metro	221.46	221
4	AP	A	417.43	417
5	Maharashtra	A	523.23	523

6	Kerala	B	199.00	199
7	MP	B	195.26	195
8	West Bengal	B	123.85	124
9	Assam	C	83.01	83
10	Himachal Pradesh	C	36.69	37
11	North East	C	22.66	23
12	Orissa	C	86.39	86

2. Para No. 4.1(c) of TRAI Recommendations

DoT should carry out harmonization exercise in West Bengal (WB) LSA in 800 MHz band so that entire available spectrum can be made contiguous and put to auction in the forthcoming auction.

DoT's View

- (i) The matter of contiguity of three blocks of 2 x 1.25 MHz spectrum owned by SSTL is sub-judice. Harmonization of 800 MHz band in West Bengal LSA can be done only after final decision by the Court in the matter.
- (ii) In view of the above, TRAI is requested to reconsider this recommendation.

Response of TRAI

Spectrum is a scarce natural and perishable resource. The Authority has been in favour of offering all available spectrum for auction and for increased utilization of available spectrum.

In the instant case, DoT had informed that in WB LSA, three carriers were available in 800 MHz band; however, 2 carriers were available without guard band and only 1 carrier is available with guard band of 0.3 MHz, which was put to auction in the year 2016. Due to non-availability of inter-operator guard band, these two carriers are not proposed to be auctioned. From the information on carrier assignments provided by DoT, it was seen that the guard

band requirement could be reduced in this band if the spectrum holding of TSPs is made contiguous. As a result, entire available spectrum in WB could be put to auction.

In view of the above, the Authority had recommended that DoT should carry out harmonisation exercise so that entire available spectrum can be put to auction. However, DoT has informed that the matter of contiguity of three blocks of 2 x 1.25 MHz spectrum owned by SSTL is sub-judice. Further, in Annexure-I to the back-reference, DoT has mentioned that in WB LSA, 10 carriers are available in 800 MHz band. However, 1 carrier cannot be made available with guard band adjacent to incumbent operator (M/s SSTL) due to pending decision of the Supreme Court.

The Authority has noted the position. However, DoT may like to pursue the matter so that an early decision is taken in this regard and spectrum is put to effective use.

3. Para No. 4.1(e) of TRAI Recommendations

Barring the specific locations or districts where ISRO is using the 25 MHz (3400 MHz - 3425 MHz) of spectrum, the entire spectrum from 3300 MHz to 3600 MHz should be made available for access services and should be included in the forthcoming auction.

DoT's View

- (i) ISRO, vide its letter no. SATCOM-PO/5G/2019 dated 26.02.2019 regarding coexistence studies of 5G IMT and Satellite service, has requested for leaving 25 MHz (from 3400 to 3425 MHz) untouched for NavIC constellation maintenance. Copy of the ISRO letter dated 26.02.2019 is enclosed.
- (ii) In view of the above, TRAI is requested to reconsider this recommendation.

Response of TRAI

In its recommendations, the Authority had noted that ISRO would be using this 25 MHz spectrum at only few locations and reserving the entire 25 MHz on Pan India basis would lead to wastage of this spectrum. Therefore, the Authority had recommended that barring the specific locations or districts where ISRO is using this spectrum, the entire spectrum from 3300 to 3600 MHz should be made available for access services and should be included in the forthcoming auction.

DoT, in its back-reference, has mentioned that ISRO has requested for leaving 25 MHz untouched for NavIC constellation maintenance. It is observed that ISRO in its letter dated 26th February 2019 (Annexure-II to the back-reference), has mentioned that the observations are based on preliminary analysis and assumptions; and models used in the analysis need to be revalidated. Further, ISRO also requested DoT for arranging a meeting for presenting and explaining the analysis.

It may be mentioned that DoT has not provided its views on the subject. The Authority has always been of the view that spectrum should be utilized efficiently. Leaving 25 MHz on pan-India basis for ISRO would lead to underutilization of this spectrum. Therefore, the Authority reiterates its earlier recommendation that barring the specific locations or districts where ISRO is using the 25 MHz (3400 MHz - 3425 MHz) of spectrum, the entire spectrum from 3300 MHz to 3600 MHz should be made available for access services and should be included in the forthcoming auction.

In case DoT decides that this 25 MHz cannot be assigned to the TSPs because of potential interference, the Authority recommends that DoT may explore whether this 25 MHz (3400 to 3425 MHz) can be earmarked for industrial use (barring the areas where ISRO would be using this 25 MHz) and allotted to entities for their

captive use. As captive use is restricted to a specified geographical area and generally low power devices are used, it is not likely to cause interference issues. This spectrum can be used by enterprise, start-ups, and industries for captive use such as dedicated network, autonomous network, industrial automation with 5G technology etc., as has recently been done in Germany, for example. It will also support and accelerate the Industry 4.0 connectivity requirements. In case DoT agrees to this recommendation of allocation of 25 MHz for captive industrial use, the detailed process of such allocation can be worked out subsequently, for which, DoT may make a separate reference to TRAI under the provisions of TRAI Act.

4. Para No. 4.2 of TRAI Recommendations

The Authority recommends that in case of 900 MHz band, the new entrant should be allowed to bid for 5 MHz if at least one chunk of contiguous 5 MHz is available, else the minimum block size should be kept as 0.6 MHz. Barring this, principles based on which all the provisions of block size and minimum quantity for bidding were specified in the NIA of September 2016, should be retained. It leads to the following table:

Table 2.12
Block size and minimum spectrum for bidding

Spectrum Band	Block Size (MHz)	Minimum amount of spectrum that a bidder is required to bid for	
		Existing licensees (MHz)	New Entrants (MHz)
700 MHz	5 (paired)	NA	5
800 MHz	1.25 (Paired)	1.25	5/ 3.75 (if only 3.75 MHz spectrum is available)/2.5 (if only 2.5 MHz spectrum is available)/ 1.25 (if only 1.25 MHz spectrum is available)
900 MHz	0.20 (paired)	0.6	5 MHz, if at least one chunk of contiguous 5 MHz is available; else, 0.6 MHz
1800 MHz	0.20 (paired)	0.6	5 MHz, if at least one chunk of contiguous 5 MHz is available; else, 0.6 MHz

2100 MHz	5 (paired)	5	5
2300 MHz	10 (unpaired)	10	10
2500 MHz	10 (unpaired)	10	10

DoT's View

- (i) The minimum amount of spectrum recommended by TRAI that a bidder is required to bid for is equal to the Block size in respect of all the bands except for 900 MHz and 1800 MHz bands wherein 0.6 MHz has been recommended as minimum amount of spectrum required to bid by existing licensees. If existing licensees are required to bid minimum 0.6 MHz amount of spectrum in 900 MHz band, then the currently available spectrum which is less than 0.6 MHz will remain unsold, e.g. in Haryana LSA, only 0.2 MHz spectrum is available in 900 MHz Band. Further, in 900 MHz Band, only 1 MHz spectrum is available in Delhi and Mumbai LSA. Therefore, there are chances that after sale of 0.6 MHz spectrum, 0.4 MHz spectrum may remain unsold. Similar problems may arise in other LSAs where residual spectrum after auction is less than 0.6 MHz.
- (ii) In view of the above, TRAI is requested to reconsider this recommendation.

Response of TRAI

The Authority agrees with the views of DoT. Accordingly, the Authority recommends that the minimum amount of spectrum that an existing licensee is required to bid in 900 MHz and 1800 MHz bands may be revised downwards from 0.6 MHz to 0.2 MHz.

5. Para No. 4.3 of TRAI Recommendations

b) Spectrum in 3300-3600 MHz band should be put to auction in the block size of 20 MHz....

d) In case a TSP acquires spectrum in 3300-3600 MHz band in more than one LSA, same frequency spots should be assigned to it in all those LSAs.

DoT's View

- (i) ISRO has requested for leaving 25 MHz (from 3400 MHz to 3425 MHz) untouched for NavIC constellation maintenance.
- (ii) In view of the above, TRAI is requested to consider the requirements of ISRO in 3400-3425 MHz band and reconsider their recommendation on block size in 3300-3400 and 3400-3600 MHz bands so that available spectrum can be fully utilized.
- (iii) TRAI recommendation regarding assignment of same frequency spot to a TSP in more than one LSA may be accepted subject to feasibility. Accordingly, TRAI is requested to reconsider their recommendation regarding assignment of same frequency spot in all the LSAs to a TSP.

Response of TRAI

In its recommendations, the Authority had noted that there is a possibility of 3300-3400 MHz and 3400-3600 MHz bands being used for new 5G mobile services because entire frequency range 3300-4200 MHz is likely to emerge as primary band for early 5G introduction. For the frequency range 3300-4200, 3GPP has identified two 5G NR band plans – n77 and n78. As per the standards frozen so far by 3GPP, for 5G NR bands n77(3300-4200 MHz) and n78(3300-3800 MHz), the supported channel bandwidth is 10 MHz, 15 MHz, 20 MHz, 30 MHz, 40 MHz, 50 MHz, 60 MHz, 70 MHz, 80 MHz, 90 MHz, and 100 MHz.

Furthermore, the Authority had recommended that barring the specific locations or districts where ISRO is using the 25 MHz (3400 MHz - 3425 MHz) of spectrum, the entire spectrum from 3300 MHz to 3600 MHz should be made available for access services and should be included in the forthcoming auction.

In view of the above, considering that (i) total 300 MHz spectrum would be available for access services, (ii) the supported channel bandwidth as per 3GPP standards, (iii) to provide flexibility and at the same time to attain greater efficiency, and (iv) to avoid the

fragmentation of these bands, the Authority recommended that spectrum in 3300-3600 MHz band should be put to auction in the block size of 20 MHz.

DoT, in its back-reference, has informed that ISRO has requested for leaving 25 MHz (from 3400 MHz to 3425 MHz) untouched for NavIC constellation maintenance. Therefore, DoT has requested TRAI to consider the requirements of ISRO in 3400-3425 MHz band and reconsider its recommendation on block size in 3300-3400 MHz and 3400-3600 MHz bands so that available spectrum can be fully utilized.

In this regard, response of Authority to Para 4.1(e) as given above, may kindly be referred to. Further, in case DoT decides to reserve 25 MHz (3400-3425 MHz) for ISRO i.e. this 25 MHz cannot be assigned to the TSPs because of potential interference, the spectrum available for auction will be 275 MHz (one chunk of 100 MHz from 3300-3400 MHz and other of 175 MHz from 3425-3600 MHz). If 20 MHz block size is retained, 15 MHz will remain unsold as it cannot be put to auction. To ensure that all available spectrum is put to auction, the Authority is of the view that block size may be kept as 5 MHz. The Authority feels that while bidding for multiple blocks of 5 MHz each, the TSPs will be able to use any of the supported channel bandwidth as per 3GPP standards. As already mentioned, as per the standards frozen so far by 3GPP, for 5G NR bands n77(3300-4200 MHz) and n78(3300-3800 MHz), the supported channel bandwidth also includes 15 MHz. This will ensure auction and utilization of entire available spectrum.

In view of the above, the Authority recommends that in case DoT decides that this 25 MHz (3400-3425 MHz) cannot be assigned to the TSPs because of potential interference, the block size for 3300-3600 MHz band may be kept as 5 MHz, in place of earlier recommended 20 MHz .

As regards DoT's view that TRAI recommendation regarding assignment of same frequency spot to a TSP in more than one LSA may be accepted subject to feasibility, the Authority agrees with DoT's view and recommends that in case a TSP acquires spectrum in 3300-3600 MHz band in more than one LSA, same frequency spots should be assigned to it in all those LSAs, subject to feasibility.

6. Para No. 4.5 of TRAI Recommendations

The Authority recommends that no roll out obligations should be mandated for spectrum in 3300-3600 MHz band. However, to avoid any misuse of not mandating any roll-out obligations, the lock-in period for spectrum in this band for becoming eligible for spectrum trading should be 5 years instead of 2 years.

DoT's View

- (i) TRAI has recommended for the lock-in period for spectrum in this band for becoming eligible for spectrum trading should be 5 years instead of 2 years, to avoid any misuse of not mandating any roll-out obligations.
- (ii) However, TRAI is requested to examine that in so far as spectrum for 5G services is concerned, whether any lock in period at all should be prescribed in the interest of greater participation and also in consideration of the following:
 - b. Relaxation in Roll out obligation should not be linked to the lock-in conditions.
 - c. Lock-in condition of 5 years for the bidding company for the 5G spectrum in 3300-3600 MHz will entail that the spectrum given through auction will remain with the same entity for 5 years and no spectrum trading will be allowed.
 - d. In the present telecom scenario, we have seen companies like M/s Aircel, M/s RCL, M/s SSTL, M/s Telenor exiting out of the mobile business and the substantial spectrum resource obtained by them has been traded or shared with existing mobile service

providers, thus protecting the Government revenue and ensuring that the spectrum is optimally utilized.

- e. In case lock-in of 5 years is imposed for the 5G Spectrum, there is distinct possibility that a telecom company which does not survive in the market is neither able to trade the spectrum thus putting the pay-out towards spectrum to DoT in jeopardy nor able to utilize the allotted spectrum due to resource constraints.
- f. One of the pre-requisites for ease of doing business is that there should be an exit route available for failed companies.

Further, in a situation of uncertainty about commercialization of 5G technology, it may be attractive to bidders to know that lock-in period is reduced.

- (iii) Accordingly, TRAI is requested to reconsider this recommendation.

Response of TRAI

For spectrum in 3300-3600 MHz band, the rationale for not mandating roll-out obligations as well as keeping a lock-in period of 5 years for becoming eligible for spectrum trading was explained in the para 2.89 & 2.90 of the Recommendations.

The main purpose of stipulating the roll-out obligations is to ensure that the spectrum is put to use in an effective and efficient manner. Considering that (i) roll out obligations are with respect to coverage, (ii) higher frequency bands, including 3300-3600 MHz band, are likely to be used in urban areas for higher network capacity, (iii) 3300-3600 MHz band is likely to be used for 5G and the TSPs will decide 5G rollout based on demand and affordability of different use cases, and (iv) ecosystem development in 3300-3600 MHz band will take some time, the Authority recommended not to mandate any roll-out obligations for 3300-3600 MHz band.

Roll-out obligations force the TSPs to invest on network and provide services. However, since prescribing roll-out obligations for

3300-3600 MHz band was not found feasible, there was a need to ensure that spectrum is put to use for the larger benefit of the economy. To ensure that the spectrum acquired through auction is put to use optimally for providing telecom services, the Authority recommended a lock-in period of 5 years for becoming eligible for spectrum trading.

DoT has, inter-alia, viewed that in case lock-in period of 5 years is imposed for the 5G Spectrum, there is distinct possibility that a telecom company which does not survive in the market is neither able to trade the spectrum thus putting the pay-out towards spectrum to DoT in jeopardy nor be able to utilize the allotted spectrum due to resource constraints. DoT has further mentioned that one of the pre-requisites for ease of doing business is that there should be an exit route available for failed companies.

It may be mentioned that 3300-3600 MHz band has been earmarked for IMT services i.e. the objective is to put this spectrum to use for IMT services. As mentioned by DoT, there could be a case where a TSP buying spectrum through auction may not find it feasible to provide services. Further, a lock-in period of 5 years may raise concerns in prospective bidders considering the developing use cases for 5G service. It has to be ensured that (i) the spectrum does not remain unutilized, (ii) attracts more players to the market and (iii) provide freedom to TSPs who wish to exit the telecom market. In order to encourage larger participation of the prospective bidders and to facilitate early deployment of 5G in India, the Authority agrees with DoT that the lock-in period should be same as in other bands i.e. 2 years.

In view of the above, the Authority recommends that no roll out obligations should be mandated for spectrum in 3300-3600 MHz band. Further, lock-in period for spectrum in this band for becoming eligible for spectrum trading should be same as in other bands i.e. 2 years.

7. Para No. 4.6 of TRAI Recommendations

The Authority recommends that the revised provisions of spectrum cap (i.e. 35% Overall cap and a Cap of 50% on the combined spectrum holding in the sub-1 GHz bands) should be extended to 3300-3600 MHz band also. Additionally, in 3300-3600 MHz band, there should be a spectrum holding cap of 100 MHz per licensee.

DOT's View

- (i) TRAI has recommended that “the revised provisions of spectrum cap (i.e. 35% Overall cap and cap of 50% on the combined spectrum holding in the sub-1 GHz bands) should be extended to 3300-3600 MHz band also. Additionally, in 3300-3600 MHz band, there should be a spectrum holding cap of 100 MHz per licensee”.
- (ii) In the event of acceptance of the request of ISRO regarding reservation of 25 MHz spectrum, total spectrum availability in 3300-3600 MHz band would reduce to 275 MHz. The basis for the TRAI recommendation is ‘To avoid monopolization of this band, there should be limit of 100 MHz per bidder’. Therefore, it is suggested that the cap could be made a percentage- 33% of the available spectrum in the 3300-3600 MHz band.
- (iii) In view of the above, TRAI is requested to reconsider their recommendation regarding spectrum holding cap in 3300-3600 MHz band.

Response of TRAI

DoT has viewed that in the event of acceptance of the request of ISRO regarding reservation of 25 MHz spectrum, total spectrum availability for auction of spectrum in 3300-3600 MHz band would reduce to 275 MHz. The basis for the TRAI recommendation, based on the availability of 300 MHz spectrum was ‘to avoid monopolization of this band, there should be limit of 100 MHz per bidder’. Therefore, DoT has suggested that the cap could be made a percentage- 33% of the available spectrum (now 275 MHz) in the 3300-3600 MHz band.

At present the spectrum cap for sub 1 GHz bands combined together is 50% for a service provider and the overall cap taking into account all the spectrum put to auction thus far, is 35%. It is, therefore, clear that there is no cap on individual bands. The recommendation for keeping an individual cap on 3300-3600 MHz band was made to avoid an eventuality where a new bidder may bid for the entire spectrum in this band and still remains compliant to the overall limit of 35%. The cap of 100 MHz nearly matches with 35% cap and is also the limit imposed by some of the countries in this band.

In view of the above, even if, DoT decides to auction only 275 MHz in this band, the Authority recommends that the spectrum cap of 100 MHz in this band should continue.

8. Para 4.8 to 4.16 of TRAI Recommendations

Relating to Spectrum Valuation & Reserve Price

DOT's View

- (i) There is huge percentage reduction in reserve prices as recommended by TRAI in their recommendations dated 01.08.2018 as compared to the 2016 auction reserve prices in 800 MHz, 900 MHz, 1800 MHz and 2100 MHz bands in some LSAs. Detail of such variations is enclosed as Annexure-III.
- (ii) Further, the Auction rule for price increment is that in the first Clock Round, the Price per block in each LSA in each of the bands will be set equal to the Reserve Price. For subsequent rounds, the Clock Round Prices in each LSA in each of the bands will be set depending on excess demand. For driving the prices up in the auction, there has to be excess demand. However, there are reasons for expecting demand to be subdued, and such spectrum to be sold at reserve prices/near reserve prices:
 - i. As brought out in the TRAI recommendation (para 2.29), "Due to competition, concerns have been expressed about the financial

health of the sector, its revenue growth and the capability of companies to meet contractual commitments etc.

- ii. Unlike the previous auctions where the number of incumbent operators were 6-8, this time the number is reduced to 3, i.e. Vodafone-Idea, Bharti Airtel and Reliance JIO.
 - iii. Both Bharti Airtel & Vodafone have raised huge amounts through rights issues to fund for capex as well as debt servicing.
- (iii) In view of the facts and circumstances brought out in para 8 (ii) above, TRAI is requested to reconsider their recommendations on spectrum valuation and reserve prices.

Response of TRAI

DoT has mentioned in para 8 of its back reference that there is a reduction in reserve prices in TRAI's recommendations dated 1st August 2018 as compared to the 2016 auction reserve prices in 800 MHz, 900 MHz, 1800 MHz and 2100 MHz bands in some LSAs and enclosed details of reduction.

In this context, it is mentioned that the Authority considered all the relevant factors, *inter-alia*, including the methodology, assumptions, developments between the spectrum auction held in October 2016 and its recommendations dated 1st August 2018 and the rationale for spectrum valuation and reserve price while giving its recommendations. This has been elaborated appropriately in Chapter-III of the afore-mentioned recommendations.

It may also be pointed out with regards to DoT's Back reference Para 8(ii)i, that what has been mis-construed by DoT as TRAI recommendation is actually a concern expressed by a section of stakeholders as a part of the consultation process.

In view of the above, the Authority reiterates the Spectrum Valuation and Reserve Prices as contained in its Recommendations dated 1st August 2018.

9. Para 4.17 of TRAI Recommendations

The Authority once again reiterates its Recommendations of 27th January, 2016 and its subsequent clarification dated 12th July 2016 on the reference back of DoT dated 24th June 2016 on Spectrum Usage Charges (SUC). The SUC shall be applicable for all spectrum bands including 700 MHz and 3300-3600 MHz.

DOT's View

- (i) It is noted that TRAI, in its recommendations dated 9th September 2013 on 'Valuation and Reserve Price of Spectrum' recommended that SUC for all auctioned spectrum should be at a flat rate of 3% of AGR of wireless services with effect from 1st April, 2014. This was reiterated by TRAI in its Recommendations of 27th January 2016 and its subsequent clarification dated 12th July 2016 on the reference back of DoT dated 24th June 2016 on Spectrum Usage Charges (SUC). This time also TRAI has reiterated its earlier recommendations in this regard.
- (ii) Considering the legal opinion received from Ld. AG, the Government had decided during the auction held in the year 2016 that the weighted average of SUC rates across all spectrum assigned to a operator (whether assigned administratively or through auction or through trading) in all access spectrum bands including BWA spectrum obtained in 2010 auction shall be applied for charging SUC subject to a minimum of 3% of AGR excluding revenues from wireline services. The weighted average is to be derived by sum of product of spectrum holdings and applicable SUC rate divided by total spectrum holding. The Weighted Average Rate is determined operator-wise for each service area.
- (iii) Accordingly, SUC on the spectrum acquired in the forthcoming auction in all bands should be charged at the rate of 3% of AGR excluding revenues from wireline services. In case of combination of access spectrum assigned to and an operator (whether assigned administratively or through earlier auctions or through forthcoming auction or through trading), weighted average of SUC rates across

all access spectrum assigned to the operator shall apply to the entire access spectrum held by the operator.

- (iv) In view of the above, TRAI is requested to reconsider this recommendation.

Response of TRAI

Regarding the request of DoT to the Authority to reconsider its recommendation on Spectrum Usage Charges (SUC), the Authority notes that in the present reference, DoT has already conveyed its decision on the subject as given in Para 9 (ii) & (iii) which is in consonance with the existing method being followed by DoT.

In view of the same, the Authority has no further comments to offer.

10. Associated Conditions for Auctions

DOT's View

- (i) It is noted that DoT vide its letter dated 19th April, 2017 had requested TRAI for recommendations on applicable reserve price, quantum of spectrum to be auctioned and associated conditions for auction of spectrum in 700 MHz, 800 MHz, 900 MHz 1800 MHz, 2100 MHz, 2300 MHz, 2500 MHz, 3300-3400 MHz and 3400-3600 MHz Bands for all the LSAs under the terms of clause 11 (1) (a) of TRAI Act, 1997 (as amended).
- (ii) In the TRAI recommendations dated 01.08.2018, it is noticed that while TRAI has given recommendations on reserve price, quantum of spectrum and some others matters pertaining to auction, it has not made recommendations on certain issues pertaining to auction, upon which it had given specific recommendations for earlier auctions, which are as under:
- a. Type of Auction.
 - b. Eligibility Conditions for Participation on Auction.
 - c. Payment Terms.
 - d. Consultation with RBI/Finance Ministry.

- e. Validity of Spectrum.
- (iii) A brief on earlier TRAI recommendations on these issues is enclosed as Annexure-IV.
- (iv) In view of the above, TRAI is requested to provide recommendations of the issue like Type of Auction, Eligibility Conditions for Participation in Auction, Payment Terms, Consultation with RBI/Finance Ministry and Validity of Spectrum etc.

Response of TRAI

DoT in its back-reference has requested TRAI to provide recommendations of the issues like Type of Auction, Eligibility Conditions for Participation on Auction, Payment Terms, Consultation with RBI/Finance Ministry and Validity of Spectrum etc. The Authority is of the view that these are the settled issues. Therefore, these were not the part of the original reference/consultation process. In case, DoT feels that any particular issue requires to be examined, a separate reference may be made to TRAI under the provisions of TRAI Act.

As regards eligibility conditions for participation in Auction for 3300-3600 MHz, the Authority is of the view that the same eligibility criteria that have been made applicable for other bands viz. 700 MHz, 800 MHz, 900 MHz, 1800 MHz, 2100 MHz, 2300 MHz and 2500 MHz bands in NIA of September 2016 should be made applicable for 3300-3600 MHz band also.

Government of India
Ministry of Communications
Department of Telecommunications
Wireless Planning & Coordination Wing

6th floor, Sanchar Bhawan,
20, Ashoka Road, New Delhi-110001.

No.: **L-14010/01/2019 - NTG**

Date: 01.07.2019

To,

The Secretary
Telecom Regulatory Authority of India
Mahanagar Doorsanchar Bhawan
Jawahar Lal Nehru Marg (Old Minto Road)
New Delhi - 110002.

Subject: Back reference on TRAI recommendations dated 01.08.2018 on Auction of Spectrum in 700 MHz, 800 MHz, 900 MHz, 1800 MHz, 2100 MHz, 2300 MHz, 2500 MHz, 3300-3400 MHz and 3400-3600 MHz bands.

Sir,

The undersigned is directed to refer to TRAI D.O. No. 103-1/2017-NSL-II dated 01.08.2018 vide which recommendations on Auction of Spectrum in 700 MHz, 800 MHz, 900 MHz, 1800 MHz, 2100 MHz, 2300 MHz, 2500 MHz, 3300-3400 MHz and 3400-3600 MHz bands were forwarded to Secretary (T), DoT and to state that:

- (i) The above said recommendations of TRAI have been considered by the Digital Communications Commission (DCC) and, on some of the issues, a need to seek clarification/reconsidered recommendation is felt. These issues are enclosed as Appendix.
 - (ii) TRAI is requested to provide reconsidered recommendations in accordance with the provisions of Section 11 of the TRAI Act 1997, as amended in 2000.
2. While reconsidering the recommendations, the following may also be examined by TRAI:
- a) The goal of National Digital Communication Policy (NDCP) 2018 includes achieving digital empowerment and improved well being of the people of the country and one of the objectives of NDCP is to provide broadband for all. Thus, pricing of spectrum should facilitate inclusive and affordable 5G services to all sections of the population and society across the country.

- b) The demand for spectrum is likely to be subdued due to consolidation in the market as at present, there are effectively three private telecom service providers.
- c) The objective should be to sell entire spectrum which is put for auction rather than having a situation where large quantum of spectrum remains unsold.
- d) In so far as spectrum for 5G services is concerned, whether any lock in period at all should be prescribed in the interest of greater participation.
- e) The feasibility of conducting future auctions of spectrum on pan-India basis rather than existing 22 Licensed Service Area wise.

The following comments may also be seen while examining para 2(e) above:

- i. So far all the spectrum auctions have been conducted on SMRA (Simultaneous Multiple Round Ascending Auction) format. It is "simultaneous" because all bands are auctioned simultaneously, and also spectrum in all LSAs is auctioned simultaneously. There is no restriction on bidders in making bids on pan-India basis in bands where spectrum is available in all LSAs. Therefore, in any case, the option of pan-India bidding is open to all bidders.
- ii. TRAI makes reserve price recommendations LSA-wise since the license agreements are LSA-wise, and it is neither mandatory for any telecom service provider to have pan-India service licenses, or pan-India spectrum.
- iii. Further, there may be other entities apart from incumbent mobile service providers, like Internet Service Providers (ISPs), or new entrants who may like to acquire spectrum in some LSAs and not on pan-India basis. In case, spectrum is to be auctioned on pan-India basis then it may have the effect of:
 - restricting the number of prospective bidders; and
 - encouraging only players with huge funds for spectrum acquisition, thereby being monopolistic in nature.
- iv. SMRS format provides the flexibility to bidders in an auction to switch from one LSA to another while bidding, as well as from one band to another. The bidders' preferences and valuations of

spectrum during the course of auction could change depending upon ascending prices vis-à-vis their options for investment to meet spectrum/business requirements in each LSA. In this regard, stipulating a pan-India bid will make reserve price into a pan-India one (rather than LSA-wise) which may not be the requirement for many bidders.

- v. There are also cases where validity of spectrum assignments of incumbents may end in some LSAs and so it may be the case for those operators to bid in only those LSAs, rather than pan-India.

Encl: As above.



(R. B. Prasad)

Joint Wireless Adviser

Issues for reconsideration of TRAI arising from its recommendations dated 01.08.2018 on Auction of Spectrum in 700 MHz, 800 MHz, 900 MHz, 1800 MHz, 2100 MHz, 2300 MHz, 2500 MHz, 3300-3400 MHz and 3400-3600 MHz bands

1. **Availability of Spectrum (Para 4.1(a) of the TRAI recommendations):**
 - (i) The Digital Communications Commission has accepted the recommendation of TRAI to put entire available spectrum to auction.
 - (ii) Spectrum availability in various bands was made available to TRAI while seeking their recommendations vide DoT letters dated 19.04.2017 and 23.07.2018. Since then, more spectrum has become available for auction due to harmonization of spectrum in 900 MHz band and surrender of spectrum by some telecom service providers (TSPs) in certain other bands.
 - (iii) On the lines of earlier recommendations dated 23.04.2012 of TRAI on auction of spectrum and decision of the Government thereon, administratively allocated spectrum in 800 MHz, 900 MHz and 1800 MHz bands may also be auctioned at least 18 months in advance to enable the winning bidders to be ready with deployment plan. Accordingly, all the administratively allocated spectrum in 800 MHz, 900 MHz and 1800 MHz bands whose validity is going to expire by 31.12.2021 may be auctioned in the forthcoming auction, barring similar access spectrum allotted administratively to Bharat Sanchar Nigam Limited (BSNL) and Mahanagar Telephone Nigam Limited (MTNL) which may be required to be allotted to BSNL and MTNL on administrative basis at an appropriate price subject to approval of competent authority.
 - (iv) Based on the above, LSA-wise total spectrum availability as on date across various band for auction in the forthcoming auction is as given in the Annexure-I.
 - (v) TRAI is requested to provide the reserve price of spectrum available in all the LSAs in all the bands.

2. **Harmonization of spectrum in 800 MHz band in West Bengal LSA (Para 4.1(c) of the TRAI recommendations):**
- (i) The matter of contiguity of three blocks of 2*1.25 MHz spectrum owned by SSSL is sub-judice. Harmonization of 800 MHz band in West Bengal LSA can be done only after final decision by the Court in the matter.
 - (ii) In view of the above, TRAI is requested to reconsider this recommendation.
3. **Reservation of spectrum for Indian Space Research Organization (ISRO) (Para 4.1(e) of the TRAI recommendations):**
- (i) ISRO, vide letter no. SATCOM-PO/5G/2019 dated 26.02.2019 regarding coexistence studies of 5G IMT and Satellite services, has requested for leaving 25 MHz (from 3400 MHz to 3425 MHz) untouched for NavIC constellation maintenance. Copy of the ISRO letter dated 26.02.2019 is placed as Annexure-II.
 - (ii) In view of the above, TRAI is requested to reconsider this recommendation.
4. **Block Size (Existing bands - 700/800/900/1800/2100/2300/2500 MHz) (Para 4.2 of the TRAI recommendations):**
- (i) The minimum amount of spectrum recommended by TRAI that a bidder is required to bid for is equal to the Block size in respect of all the bands except for 900 MHz and 1800 MHz bands wherein 0.6 MHz has been recommended as minimum amount of spectrum required to bid by existing licensees. If existing licensees are required to bid minimum 0.6 MHz amount of spectrum in 900 MHz band, then the currently available spectrum which is less than 0.6 MHz will remain unsold e.g. in Haryana LSA, only 0.2 MHz spectrum is available in 900 MHz Band. Further, in 900 MHz Band, only 1 MHz spectrum is available in Delhi and Mumbai LSA. Therefore, there are chances that after sale of 0.6 MHz spectrum, 0.4 MHz spectrum may remain unsold. Similar problems may arise in other LSAs where residual spectrum after auction is less than 0.6 MHz.
 - (ii) In view of the above, TRAI is requested to reconsider this recommendation.

5. Block Size (3300-3400 MHz and 3400-3600 MHz bands) (Para 4.3 of the TRAI recommendations):

- (i) ISRO has requested for leaving 25 MHz (from 3400 MHz to 3425 MHz) untouched for NavIC constellation maintenance.
- (ii) In view of the above, TRAI is requested to consider the requirements of ISRO in 3400-3425 MHz band and reconsider their recommendation on block size in 3300-3400 and 3400-3600 MHz bands so that available spectrum can be fully utilized.
- (iii) TRAI recommendation regarding assignment of same frequency spot to a TSP in more than one LSA may be accepted subject to feasibility. Accordingly, TRAI is requested to reconsider their recommendation regarding assignment of same frequency spot in all the LSAs to a TSP.

6. Roll-Out Obligations (3300-3400 MHz and 3400-3600 MHz bands) (Para 4.5 of the TRAI recommendations):

- (i) TRAI has recommended for the lock-in period for spectrum in this band for becoming eligible for spectrum trading should be 5 years instead of 2 years, to avoid any misuse of not mandating any roll-out obligations.
- (ii) However, TRAI is requested to examine that in so far as spectrum for 5G services is concerned, whether any lock in period at all should be prescribed in the interest of greater participation and also in consideration of the following:
 - (a) Relaxation in Roll out obligation should not be linked to the lock-in conditions.
 - (b) Lock-in-condition of 5 years for the bidding company for the 5G spectrum in 3300-3600 MHz will entail that the spectrum given through auction will remain with the same entity for 5 years and no spectrum trading will be allowed.
 - (c) In the present telecom scenario, we have seen companies like M/s Aircel, M/s RCL, M/s SSSL, M/s Telenor exiting out of the mobile business and the substantial spectrum resource obtained by them has been traded or shared with existing mobile service providers, thus protecting the Government revenue and ensuring that the spectrum is optimally utilized.

(d) In case lock-in of 5 years is imposed for the 5G spectrum, there is distinct possibility that a telecom company which does not survive in the market is neither able to trade the spectrum thus putting the pay-out towards spectrum to DoT in jeopardy nor able to utilize the allotted spectrum due to resource constraints.

(e) One of the pre-requisites for ease of doing business is that there should be an exit route available for failed companies.

Further, in a situation of uncertainty about commercialization of 5G technology, it may be attractive to bidders to know that lock-in period is reduced.

(iii) Accordingly, TRAI is requested to reconsider this recommendation.

7. Spectrum Cap (Para 4.6 of the TRAI recommendations):

(i) TRAI has recommended that *"the revised provisions of spectrum cap (i.e. 35% Overall cap and a Cap of 50% on the combined spectrum holding in the sub-1 GHz bands) should be extended to 3300-3600 MHz band also. Additionally, in 3300-3600 MHz band, there should be a spectrum holding cap of 100 MHz per licensee"*.

(ii) In the event of acceptance of the request of ISRO regarding reservation of 25 MHz spectrum, total spectrum availability in 3300-3600 MHz band would reduce to 275 MHz. The basis for the TRAI recommendation is "To avoid monopolization of this band, there should be limit of 100 MHz per bidder". Therefore, it is suggested that the cap could be made a percentage - 33% of the available spectrum in the 3300-3600 MHz band.

(iii) In view of the above, TRAI is requested to reconsider their recommendation regarding spectrum holding cap in 3300-3600 MHz band.

8. Spectrum Valuation and Reserve Price (Para 4.8 to 4.16 of the TRAI recommendations):

(i) There is huge percentage reduction in reserve prices as recommended by TRAI in their recommendations dated 01.08.2018 as compared to the 2016 auction reserve prices in 800 MHz, 900 MHz, 1800 MHz and 2100 MHz bands in some LSAs. Detail of such variations is enclosed as Annexure-III.

- (ii) Further, the Auction rule for price increment is that in the first Clock Round, the price per block in each LSA in each of the bands will be set equal to the Reserve Price. For subsequent rounds, the Clock Round Prices in each LSA in each of the bands will be set depending on excess demand. For driving the prices up in the auction, there has to be excess demand. However, there are reasons for expecting demand to be subdued, and such spectrum to be sold at reserve prices/near reserve prices:
- i. As brought out in the TRAI recommendation (para 2.29), "Due to competition, concerns have been expressed about the financial health of the sector, its revenue growth and the capability of companies to meet their contractual commitments etc.
 - ii. Unlike the previous auctions where the number of incumbent operators were 6-8, this time the number is reduced to 3, i.e. Vodafone-Idea, Bharti Airtel and Reliance JIO.
 - iii. Both Bharti Airtel & Vodafone-Idea have raised huge amounts through rights issues to fund for capex as well as debt servicing.
- (iii) In view of the facts and circumstances brought out in para 8(ii) above, TRAI is requested to reconsider their recommendations on spectrum valuation and reserve prices.

9. Spectrum Usage Charges (Para 4.17 of the TRAI recommendations):

- (i) It is noted that TRAI, in its recommendations dated 9th September 2013 on 'Valuation and Reserve Price of Spectrum' recommended that SUC for all auctioned spectrum should be at a flat rate of 3% of AGR of wireless services with effect from 1st April, 2014. This was reiterated by TRAI in its Recommendations of 27th January, 2016 and its subsequent clarification dated 12th July 2016 on the reference back of DoT dated 24th June 2016 on Spectrum Usage Charges (SUC). This time also TRAI has reiterated its earlier recommendations in this regard.
- (ii) Considering the legal opinion received from Ld. AG, the Government had decided during the auction held in the year 2016 that the weighted average of SUC rates across all spectrum assigned to an operator (whether assigned administratively or through auction or through trading) in all access spectrum bands including BWA spectrum obtained in 2010 auction shall be applied for charging SUC subject to a minimum of 3% of

AGR excluding revenues from wireline services. The weighted average is to be derived by sum of product of spectrum holdings and applicable SUC rate divided by total spectrum holding. The Weighted Average Rate is determined operator-wise for each service area.

- (iii) Accordingly, SUC on the spectrum acquired in the forthcoming auction in all bands should be charged at the rate of 3% of AGR excluding revenues from wireline services. In case of combination of access spectrum assigned to an operator (whether assigned administratively or through earlier auctions or through forthcoming auction or through trading), weighted average of SUC rates across all access spectrum assigned to the operator shall apply to the entire access spectrum held by the operator.
- (iv) In view of the above, TRAI is requested to reconsider this recommendation.

10. Associated Conditions for Auction:

- (i) It is noted that DoT vide its letter dated 19th April, 2017, had requested TRAI for recommendations on applicable reserve price, quantum of spectrum to be auctioned and associated conditions for auction of spectrum in 700 MHz, 800 MHz, 900 MHz, 1800 MHz, 2100 MHz, 2300 MHz, 2500 MHz, 3300-3400 MHz and 3400-3600 MHz Bands for all the LSAs under the terms of clause 11 (1) (a) of TRAI Act, 1997 (as amended).
- (ii) In the TRAI recommendations dated 01.08.2018, it is noticed that while TRAI has given recommendations on reserve price, quantum of spectrum and some other matters pertaining to auction, it has not made recommendations on certain issues pertaining to auction, upon which it had given specific recommendations for earlier auctions, which are as under:
 - a. Type of Auction.
 - b. Eligibility Conditions for Participation on Auction.
 - c. Payment Terms.
 - d. Consultation with RBI/Finance Ministry.
 - e. Validity of Spectrum.

A brief on earlier TRAI recommendations on these issues is enclosed as Annexure-IV.

- (iii) In view of the above, TRAI is requested to provide recommendations of the issues like Type of Auction, Eligibility Conditions for Participation on Auction, Payment Terms, Consultation with RBI/Finance Ministry and Validity of Spectrum etc.

Spectrum Availability for Auction

(in MHz)

Sl. No.	LSA	Frequency Band (Band Plan)								
		700 MHz (FDD)	800 MHz (FDD)	900 MHz (FDD)	1800 MHz (FDD)	2100 MHz (FDD)	2300 MHz (TDD)	2500 MHz (TDD)	3300-3400 MHz (TDD)	3400-3600 MHz (TDD)
1	Andhra Pradesh	35	13.75	3.0	12.6	20	20	30	100	175
2	Assam	35	2.50	4.6	3.0	15	20	0	100	175
3	Bihar	35	12.50	9.2	8.6	10	20	10	100	175
4	Delhi	35	12.50	1.0	25.4	15	20	20	100	175
5	Gujarat	35	6.25	3.0	17.8	15	20	10	100	175
6	Haryana	35	10.00	0.2	19.4	10	40	0	100	175
7	Himachal Pradesh	35	10.00	4.6	19.0	20	20	10	100	175
8	Jammu and Kashmir	35	2.50	0.0	14.0	10	40	10	100	175
9	Karnataka	35	13.75	3.2	21.0	15	20	40	100	175
10	Kerala	35	13.75	4.6	16.4	10	20	0	100	175
11	Kolkata	35	12.50	3.0	14.4	15	20	20	100	175
12	Madhya Pradesh	35	12.50	4.6	15.0	15	20	0	100	175
13	Maharashtra	35	15.00	3.0	22.2	10	20	10	100	175
14	Mumbai	35	10.00	1.0	15.6	15	20	20	100	175
15	North East	35	2.50	3.8	0.0	15	20	0	100	175
16	Orissa	35	11.25	4.6	5.8	15	20	0	100	175
17	Punjab	35	11.25	0.0	19.4	10	40	10	100	175
18	Rajasthan	35	12.50	0.0	16.8	0	40	0	100	175
19	Tamilnadu	35	13.75	17.0	17.6	5	20	40	100	175
20	Uttar Pradesh (East)	35	12.50	5.2	15.0	5	40	0	100	175
21	Uttar Pradesh (West)	35	12.50	1.2	19.4	15	40	0	100	175
22	West Bengal	35	12.50	4.6	5.2	15	20	0	100	175
Total		770	236.25	81.4	323.6	275	560	230	2200	3850

Note: (1) Spectrum availability in 700, 800, 900, 1800, 2100 MHz bands is shown as paired bandwidth i.e. 35.00 MHz availability means 35+35 MHz including both uplink and downlink spectrum.

(2) In West Bengal LSA, 10 carriers are available in 800 MHz band. However, 1 carrier cannot be made available with guard band adjacent to incumbent operator (M/s SSSL) due to pending decision of the Supreme Court.

भारत सरकार
अन्तरिक्ष विभाग
ज्ञानप्रह संचार कार्यक्रम कार्यालय
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ANNEXURE-4
EK318795 1311IN
Government of India
Department of Space
**SATELLITE COMMUNICATION
PROGRAMME OFFICE**
Antariksh Bhavan, New BEL Road,
Bangalore - 560 231, India
Telephone : +91-80-2341 5474
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No. SATCOM-PO/5G/2019

384361/2019)CR February 26, 2019

Note: Regarding co-existence studies of 5G IMT and Satellite Services

1. WRC-2019 has identified several bands under Agenda item 1.13 for possible identification for terrestrial IMT-2020 (also known as 5G). Some of these bands are also identified and are being used for different types of satellite services.
2. Further, a High Level Forum and NFAP-2018 have also identified few frequency bands for terrestrial services, including 5G IMT, that clash with satellite services.
3. A careful analysis and study need to be undertaken for the impact of the new services on the existing/planned satellite services, before any of these frequency bands are firmed up or before India's position/inputs to the WRC-2019 is communicated.
4. As was discussed during the second meeting of the standing committee on spectrum policy for 5G India 2020, held on 14th January 2019, DOS had presented the analysis on coexistence of satellite and 5G services in various frequency bands of interest to CEWiT, IIT-Madras on January 24, 2019 and subsequently had submitted these analyses formally to CEWiT, IITM on Feb 04, 2019 and Feb 11, 2019.
5. Further, I am hereby enclosing the preliminary analysis carried out by DOS/ISRO for coexistence study in the following frequency bands, for kind consideration and examinations by WPC/DOT:

- i. 3.4 - 3.425 GHz
- ii. 3.6- 3.7 GHz
- iii. 5.250- 5.557 GHz
- iv. 17.7 -19.7 GHz
- v. 23.6 – 24 GHz (Out of band emissions)
- vi. 24.25- 27.5 GHz
- vii. 27.5- 29.5 GHz
- viii. 37.0-43.5 GHz

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भारतीय अन्तरिक्ष अनुसंधान संगठन

Indian Space Research Organisation

6. It may please be noted that this is a preliminary analysis and few of the assumptions and models used in the analysis need to be revalidated/ revisited before arriving at any conclusion. DOS/ISRO will be looking forward to receiving any suggestion/discussions with WPC/DOT in this regard.
7. We also request WPC/DOT to arrange a meeting with DOS at the earliest for presenting and explaining these analyses to the experts of WPC/DOT to firm up India's position/inputs to WRC-2019 well in time.

P. J. S. R. S. R.
(T.K. Anuradha)
Director, SATCOM-PO

To:
Wireless Adviser, DoT

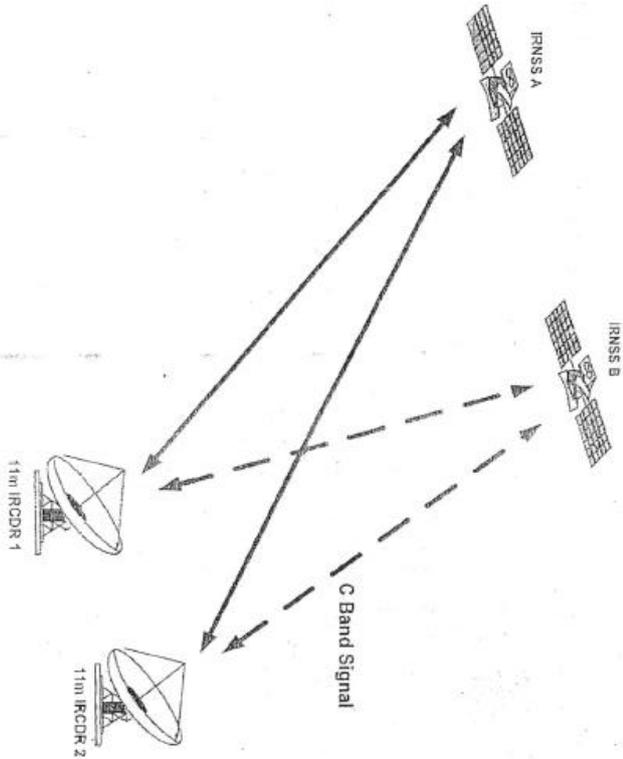
Copy for the kind information:

- Additional Secretary, DOT
- Secretary, DOT
- Secretary, DOS

C-Band (3.4-3.425 GHz)

Satellite System Parameters:

- Satellite EIRP per Signal: 12 dBW
- Number of Signals: 6
- Receive Antenna Size: 11 m
- Signal Mod.: CDMA (10 Mcps, BPSK)
- Rx ES Antenna pattern: ITU-R 580-6
- Satellite Max Distance: 41000 km
- Path loss model: ITU-R M.2412-0
- Min Satellite Elevation Angle: 5 deg
- ES Protection Criterion: 6% ($\Delta T/T$)



Summary

- It can be seen that considering emission from even one station (Base station/mobile terminal), the protection distance ranges from 35-1400 Km.
- Cumulative power from Base station and number of mobiles within cell must be estimated and factored appropriately to further work out the separation distance.
- In addition, the estimation of number of base stations transmitting towards satellite ranging Earth station and their cumulative power and then ensuring such separation distances is a challenge.
- Hence, DOS recommends leaving 25 MHz untouched for NavIC constellation maintenance.

Variations in Reserve Prices in 700/800/900/1800/2100 MHz bands**700 MHz Band**

LSA	Reserve Price for Auction 2016 (Crore of Rs.) per MHz	Recommended Reserve Price for the upcoming Auction (Crore of Rs.) per MHz	Percentage change in Reserve Price per MHz
Delhi	1595	915	-42.63
Mumbai	1192	1122	-5.87
Kolkata	596	347	-41.78
Andhra Pradesh	971	557	-42.64
Gujarat	952	546	-42.65
Karnataka	740	219	-70.41
Maharashtra	1272	729	-42.69
Tamilnadu	900	199	-77.89
Haryana	186	113	-39.25
Kerala	334	190	-43.11
Madhya Pradesh	331	190	-42.60
Punjab	308	177	-42.53
Rajasthan	364	211	-42.03
U. P. (East)	459	305	-33.55
U.P. (West)	384	230	-40.10
West Bengal	183	105	-42.62
Assam	158	92	-41.77
Bihar	248	175	-29.44
Himachal Pradesh	64	37	-42.19
Jammu & Kashmir	52	30	-42.31

North East	44	25	-43.18
Orissa	152	54	-64.47

800 MHz Band

LSA	Reserve Price Auction 2016 (Crore of Rs.) per MHz	Recommended Reserve Price for the upcoming Auction (Crore of Rs.) per MHz	Percentage change in Reserve Price per MHz
Delhi	848	640	-24.53
Andhra Pradesh	606	390	-35.64
Karnataka	303	192	-36.63
Maharashtra	799	510	-36.17
Tamilnadu	360	174	-51.67
Kerala	243	157	-35.39
Madhya Pradesh	408	143	-64.95
U.P. (West)	182	161	-11.54
West Bengal	82	74	-9.76
Orissa	57	47	-17.54

900 MHz Band

LSA	Reserve Price Auction 2016 (Crore of Rs.) per MHz	Recommended Reserve Price for the upcoming Auction (Crore of Rs.) per MHz	Percentage change in Reserve Price per MHz
Gujarat	673	373	-44.58
Karnataka	558	238	-57.35
Haryana	151	102	-32.45
U. P. (East)	776	262	-66.24
U.P. (West)	739	211	-71.45
Bihar	444	201	-54.73

1800 MHz Band

LSA	Reserve Price Auction 2016 (Crore of Rs.) per MHz	Recommended Reserve Price for the upcoming Auction (Crore of Rs.) per MHz	Percentage change in Reserve Price per MHz
Karnataka	185	109	-41.08
Tamilnadu	225	100	-55.56
Orissa	38	27	-28.95

2100 MHz Band

LSA	Reserve Price Auction 2016 (Crore of Rs.) per MHz	Recommended Reserve Price for the upcoming Auction (Crore of Rs.) per MHz	Percentage change in Reserve Price per MHz
Kolkata	116	115	-0.86
Andhra Pradesh	272	185	-31.99
Gujarat	258	181	-29.84
Karnataka	328	91	-72.26
Madhya Pradesh	123	68	-44.72
U.P. (West)	111	76	-31.53
West Bengal	52	35	-32.69
Assam	46	30	-34.78
Himachal Pradesh	20	12	-40.00
North East	12	6	-50.00

Associated Conditions for Auction

A. Type of Auction:

- i. Recommendations of 27th September 2006 on 'Allocation and pricing of spectrum for 3G and broadband wireless access services' recommended (Para 4.59) that the spectrum auction for 2.1 GHz band should use a simultaneous ascending auction system.
- ii. Recommendations of 11th July 2008 On 'Allocation and Pricing for 2.3-2.4 GHz, 2.5-2.69 GHz & 3.3-3.6 GHz bands' recommended (Para 3.13) that Simultaneous ascending e-Auction method may be used for auction of spectrum in BWA bands.
- iii. Recommendations of 23rd April 2012 on 'Auction of Spectrum' recommended (sl. no.12 of Summary of Recommendations) that the auction of spectrum shall be conducted using Simultaneous Multiple Round Auction (SMRA) format.

B. Eligibility Conditions for participation in Auction

- i. Recommendations of 11th July 2008 on 'Allocation and Pricing for 2.3-2.4 GHz, 2.5-2.69 GHz & 3.3-3.6 GHz bands' recommended (Para 2.2) that for the spectrum bands of 2.3-2.4 GHz, 2.5-2.69 GHz and 3.3-3.4 GHz, UASL, CMSPs and Category 'A' & 'B' ISPs should be eligible for participating in the auction for the spectrum.
- ii. Recommendations of 9th September 2013 on 'Valuation and Reserve Price of Spectrum' recommended (Para 2.38) that the eligibility conditions prescribed in the recently held auctions (November 2012 and March 2013) should be retained for the upcoming auction.
- iii. Recommendations of 23rd April 2012 on 'Auction of Spectrum' recommended (Para 3.39) that every auction shall be open to all those holding CMTS licence/ UAS licence / Unified licence or eligible for grant of Unified Licence. Auction shall not be open to those that hold spectrum above the prescribed cap.
- iv. Recommendations of 27th January 2016 on 'Valuation and Reserve Price of Spectrum in 700 MHz, 800 MHz, 900 MHz, 1800 MHz, 2100 MHz, 2300 MHz and 2500 MHz Bands' recommended (Para 2.145) that the same eligibility criteria that have been made applicable for other bands viz. 800 MHz, 900 MHz, 1800 MHz and 2100 MHz band in January 2015 NIA should be made applicable for 2300 MHz and 2500 MHz bands. The same eligibility criteria should also be made applicable for 700 MHz band also.

C. Payment Terms

- i. Recommendations of 9th September 2013 on 'Valuation and Reserve Price of Spectrum' recommended (Para 7.16) that the payment terms should be structured by the Government to address financing issues of the bidders in the proposed auction.
- ii. Recommendations of 23rd April 2012 on 'Auction of Spectrum' recommended (Para 3.113) a schedule for deferred payment of the bid amount by the successful bidders.
- iii. DoT's reference of 8th January 2015 to TRAI, stated that taking note of the fact that in the previous auction of 2100 MHz band, 100% upfront payment was stipulated and therefore, TRAI is requested to provide reconsidered opinion/clarification on payment terms and condition for auction of 2100 MHz band. TRAI, in its response letter of 15th January 2015 replied (Page 32) that as stated in its September 2013 Recommendations, the Authority is of the view that the structuring of the payment terms is a matter that needs to be decided by the Government factoring in, amongst other things, the current budgetary requirements. The decision on the matter is solely the prerogative of the Government and the Authority would, therefore, not wish to make any specific recommendation in this regard.
- iv. TRAI, in its response letter of 18th April 2016 to DoT's reference on recommendations dated 1st April 2016, stated (Page 40) that the Authority has examined the payment terms issue again and is of the view that the longer tenure for payment enhances the bidder(s) capacity to pay/liquidity and will also incentivize them to participate in the auction. The liberal terms of payment in the form of reduced upfront payment and longer payment schedule will result in a situation where bidders would find themselves in 'pay as you earn' situation and will not be burdened by payments in the initial years. There would be no loss to the Exchequer as the instalment will contain the interest element also. At the same time there may be larger participation of the TSPs in the auction as they get some leverage in making payment over a longer time horizon. The Authority further notes that there is possibility where (a) successful bidders may like to opt for option of lump sum payment of bid amount (i.e. 100% upfront payment) or (b) under instalment scheme after payment of some annual instalments, may like to prepay the entire or part of the outstanding balance. In view of the above, the Authority recommends the following payment schedule options for successful bidder in the forthcoming auction.

D. Consultation with RBI/ Finance Ministry

- i. TRAI, in its Recommendations of 9th September 2013 on 'Valuation and Reserve Price of Spectrum' recommended (Para 7.32) that the DoT should take up the matter with RBI before the proposed auction so as to ensure that commercial banks and other lending institutions are in a position to provide loans to the telecom companies for participation in the auction.
- ii. TRAI, in its Recommendations of 23rd April 2012 on 'Auction of Spectrum' recommended (Para 3.127) that the Department of Telecommunications must take up with the Ministry of Finance and the Reserve Bank of India to remove all the roadblocks in the framework for borrowings by the telecom sector against the spectrum assigned to them.

E. Validity of Spectrum

- i. TRAI, in its Recommendations of 23rd April 2012 on 'Auction of Spectrum' recommended that the validity period of the spectrum should be for 20 years. (Summary of Recommendations 33).