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TRAI/FY21-22/021

14th July 2022

**Shri Syed Tausif Abbas,
Advisor (Networks, Spectrum and Licensing)**

Telecom Regulatory Authority of India,
Mahanagar Door Sanchar Bhawan,
JawaharLal Nehru Marg,
New Delhi – 110 002

Subject : Bharti Airtel's Response to Consultation Paper on Spectrum Requirements of National Capital Region Transport Corporation (NCRTC) for Train Control System for RRTS Corridors

Reference : TRAI's Consultation Paper on Spectrum Requirements of National Capital Region Transport Corporation (NCRTC) for Train Control System for RRTS Corridors dated 9th June 2022

Dear Sir,

This is in reference to TRAI's consultation paper on Spectrum Requirements of National Capital Region Transport Corporation (NCRTC) for Train Control System for RRTS Corridors dated 9th June 2022

In this regard, please find enclosed our comments on the captioned Consultation Paper for your kind consideration.

Thanking You,

Yours' Sincerely,
For **Bharti Airtel Limited**

A handwritten signature in blue ink, appearing to read 'Rahul Vatts', is written over a light blue circular stamp.

Rahul Vatts
Chief Regulatory Officer

Encl: a.a



Response to TRAI CP on “Spectrum Requirements of National Capital Region Transport Corporation (NCRTC) for Train Control System for RRTS Corridors”

Preamble:

At the outset, we place our sincere thanks to TRAI for providing us an opportunity to submit our response to this Consultation paper. We hope that TRAI will consider our submissions favorably.

We believe this paper is crucial, not just for spectrum needs of NCRTC or other such commercial PSUs or Government agencies who as new users are increasingly seeking commercial IMT bands – the bands which have huge bearing on the larger public good – but also for TSPs since such demands is putting immense pressure on the entire mobile ecosystem, TSPs/ mobile networks’ present and future spectrum needs.

Low-band spectrum below 1 GHz, is the cornerstone of digital equality and a driver of broad and affordable connectivity¹. It is a crucial national asset that can build bridges towards digital inclusion and ensure the impact of mobile’s economic and social benefits are available to all communities.

Hence, it will be a defining paper in the sense whether the TRAI and DoT should continue to keep reducing the available 700MHz thus impacting the India’s digital growth story and deployment for rural broadband, OR, leverage this as opportunity to come out with a long term roadmap for spectrum needs of such users of railways segment, albeit in alternate and non IMT bands and thereby mitigating the negative impact on public good.

Summary:

A. Full availability of 700MHz is critical for inclusion and India’s digital ambition

It is well known that 700 MHz band globally harmonized and identified for deployment of IMT applications in the telecommunication services by various countries. The key advantages of this band include wider coverage area and higher penetration inside buildings. The low-band capacity will be at the core of ensuring that 5G is available to everyone. More spectrum in this range is vital to giving rural communities equitable access to 5G services available in urban areas and pushing towards digital inclusion goals and helping to unlock new use cases for all. At the same time, low-bands can help improve the quality of enhanced mobile broadband coverage for hard-to-reach places, such as deep indoors or narrow alleys.

As a matter of fact, in India, out of 45 MHz (paired) of 700 MHz band, 10 MHz (paired) has already been assigned to MoD and 5 MHz (paired) to Indian Railways. **This has already reduced the availability in full band by 33%, thus making** remaining 30 MHz already grossly inadequate for TSPs. It would not be appropriate to fragment the band any further by giving away another 5 MHz to RRTS, **which would reduce the availability further by 16.67% from 30MHz or, on overall basis (45MHz) would have reduced availability by 44%.**

¹ Coleago Consulting. “The need for sub-1 GHz spectrum to deliver the vision of 5G”
<https://www.gsma.com/spectrum/wp-content/uploads/2022/06/5G-Low-Band-Spectrum.pdf>

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This is grossly inadequate considering the current number of operators and new operators that may enter the industry in future. Such scarcity would have a direct impact on the provision of services and realization of goals of NDCP viz. providing broadband to all and ensuring connectivity to all uncovered areas.

Hence, we are of the view that new Spectrum in 700 MHz band should not be allocated to NCRTC and rather, as earlier recommended by TRAI, the Indian Railways should share the spectrum allocated to it with NCRTC.

B. Railways segment's spectrum needs a new, clear roadmap than disruption in MNOs' spectrum needs: Railways should share existing 700MHz with NCRTC else find a new non-IMT band:

Spectrum, a public good, is an extremely powerful engine of socio-economic growth, therefore, it is important to have a clear roadmap for both short and long term including quantum of Spectrum and timelines for availability of the bands.

For all Spectrum needs in India, the NFAP-2018 provides a broad roadmap showing spectrum earmarked for various users and technologies. However, given the surge in demand from government / PSUs like Indian Railways, NCRTC etc., there is a need to assess their demands independently and define a clear roadmap to cater to their ongoing and future demands, while ensuring no risk to Mobile networks/TSPs spectrum needs. It becomes crucial since earlier the demand came from Indian Railways (IR), now from NCRTC and in future other demands may also come from other similar or new category of such users. It is thus important to have a clear roadmap for the understanding of all stakeholders as to what bands are made available for their non-commercial usage.

We appreciate and strongly support the Authority's concern noted in the present Consultation Paper, i.e.:

"As per the 3GPP band plan B28 adopted by India for 700 MHz band, 45 MHz (paired) spectrum can be utilized in this band. However, 10 MHz (paired) spectrum has been earmarked for government use and 5 MHz (paired) spectrum has been assigned to Indian Railways for LTE-based public safety and security services (train signalling system for safety and security) across the railway track. Therefore, 30 MHz (paired) spectrum is available for commercial purpose in each of the 22 LSAs in this band. In case 5 MHz (paired) spectrum is earmarked for NCRTC and other RRTS/metro rail networks pan India, only 25 MHz (paired) spectrum will be left for commercial use. One view could be that since 700 MHz band is a prime coverage band for 5G, the remaining spectrum may not be enough for the TSPs for commercial purpose."

It is critical to carefully consider the options of spectrum assignment to various Railways entities without undermining or risking spectrum needs of TSPs/ Mobile networks.

In case of RRTS, it is amply clear that the spectrum already allocated to Indian Railways can cater to the needs of RRTS as well. TRAI after careful evaluation while recommending 5 MHz in 700 MHz band to IR, had clearly stated that this may be given to other entities in other areas. The relevant extract of TRAI recommendation is given below:

"...As Indian Railways would be using the assigned spectrum along its railway track network and stations only, DoT may explore the possibility of assigning the same spectrum in other areas for area-specific limited use to

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other entities for captive use. However, it should be ensured that there is no interference to the Railways' network from such use..."

It is evident that the demand from NCRTC was also for the same spectrum based on TRAI recommendations. The Authority in the Paper also notes that on the advice of the Railway Board, the NCRTC engaged a group of eminent experts to conduct a feasibility study for co-existence of two separate LTE networks of NCRTC and IR in the same band. Worthwhile that this was the same expert group which was engaged by Indian Railways to study the feasibility of use of LTE technology on IR. The expert group has given technical clearance for the sharing and co-existence of both the systems in the same frequency band without any interference. Relevant extracts from the report is given below:

After conducting the study, this project report was prepared for NCRTC, jointly by CEWIT, IITM and IITH. The study has taken the expert opinion while evaluating the feasibility of co-existence of two separate LTE networks of NCRTC and IR using the same spectrum. The report was prepared based on general understanding of the experts in the subject matter. Nevertheless, when the deployment is done after careful planning, the interference from the NCRTC network to IR network and vice-versa can be minimized/negligible to a considerable extent. Suitable deployment strategies to handle the interference caused in either networks are suggested in this report.

The study concludes that both NCRTC and IR can use the same entire 5 MHz bandwidth for their critical operations in majority of the places without affecting the IR network, even with no coordination with IR, by employing the techniques which have been detailed in the report. However, minimal coordination during the network planned stages in certain locations NCRTC can benefit both, thus enabling the use of the entire bandwidth in all places. Even in the highly unlikely scenario of having any interference, other scheduling methods, transmit beamforming along with signal processing at the receiver using multiple antennas etc. are available to solve the problem. The ETCS operation can be performed with high reliability along with MCPTT and also CCTV surveillance data transfer can be done in majority of the corridor. The study also concludes that the required throughput for these ETCS operations can be very well provided using the spectrum allotted for the purpose by employing the strategies mentioned in the report.

In view of the findings and conclusion of the experts in the above report, **we do not believe** there is need to give any separate additional spectrum to NCRTC, more so since co-existence between IR & NCRTC is possible.

While we strongly recommend that the Government allocates the same spots as given to IR in the 700MHz to NCRTC as well, **if at all any additional spectrum is required to be given to NCRTC, then it should be done in other bands.**

Since spectrum requirement for signaling purpose in Rail Networks is of the nature of low bandwidth, high coverage and spectrum in sub-1 GHz bands will meet the requirement, there are various bands available

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through which these requirements could be met. There are various **other bands available for use by Indian Railways, NCRTC and any other rail agency** (i.e. 150, 300, 400 MHz) and should be considered in first instance in order to avoid undue costs, technical complexities and missed economic opportunities.

Several countries such as **Japan have allocated 400 MHz band** for RSTT since the 1960s. Japan has been experimenting with the 44 GHz band and have launched a system to be deployed in this band for RSTT maintenance services (using voice and data).

China has also deployed its RSTT system **in 450 MHz** band over its 80000Kms lines and proposed evolution of FDD LTE based RSTT system currently tested in this band.

In Australia, Telstra has been supplying railway communications to the Australia Rail Track Corporation using its 850 MHz spectrum and has plans to upgrade to 4G using its 700 MHz network.

Similarly, NCRTC can be allocated the 450-470 MHz for deployment of LTE based RSTT. This would help mitigate the complexities of interference planning between public mobile networks and RSTT applications.

C. How does this natural resource serve public good better? By pricing it unsustainably high for TSPs who are keen to acquire in auctions and deploy it, OR, proposed to be given without any cost to Railways:

There has been a view, also captured in TRAI paper² that the 700MHz band remained unsold in the previous auction, could be a case for giving it to IR/ RSTT needs.

However, that is a simplistic argument and does not go at the root of the issue. **Who can better deploy this precious natural resource of 700MHz band for larger public good?** The TSPs – who are ready to buy it in auction provided the exorbitant pricing of the band is drastically reduced, OR the Railways/NCRTC who need it just for the signaling purpose and been given free of cost?

The trade-off between significantly enhanced broadband coverage at lesser cost due to 700MHz band's inherent propagation quality, improved quality of service and experience, thus wider digital inclusion; and; giving such a band for restrictive signaling (which is also critical) application for captive use – should not be tough choice to make, especially when for latter, alternate options exist (see previous section B).

It is submitted that availability of 'adequate spectrum' at the 'right price' is central to the growth of the telecom sector. Right price means that prices should be at a level that should ensure the financial sustainability of the mobile industry and affordability of the services. The pricing of 700 MHz for TSPs has been extremely high till date, and which is fundamentally different to the financial T&Cs of the same spectrum given to IR. Hence the argument that 700MHz has remained unsold, thus could be given to IR/NCRTC for free, does not hold water. If TSPs were to get 700MHz on same or competitively similar financial terms as given to IR, a good likelihood that spectrum in crucial 700MHz band would see uptake.

² See para 2.24, "Another view could be that...."



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In-fact, in our response to TRAI's consultation paper³ on 5G/IMT spectrum, we had submitted the following w.r.t 700MHz band, precisely understanding importance of this band for rural broadband expansion:

"...Considering this, the Government should consider allocating the spectrum in the 700MHz band to TSPs at a cost which may only allow it to recover administrative costs (or nominal costs) via auction. The same should be tied up with rollout obligations, especially for rural towns and villages. At least 30-40MHz of sub-GHz spectrum per operator would be required for any meaningful 5G service..."

In view of the above, we recommend that no further spectrum from 700 MHz band which has long been identified for IMT in India, has globally developed IMT ecosystem, but whose supply in India has already been reduced by 33% - should be given to NCRTC.

With the above context, we now provide our Questions wise response.

³ Auction of Spectrum in frequency bands identified for IMT/5G, 30th November 2021, see Airtel response to Q47 & 48

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1. In which band, spectrum should be assigned to NCRTC for their LTE-R technology based Train control system for RRTS rail corridors?
2. How much spectrum in the spectrum band(s) suggested in response to Q1, should be assigned to NCRTC to meet its requirement for its RRTS LTE-R based network?

Airtel Response: We recommend that the Government allocates the same spots as already given to Indian Railways in the 700MHz, to NCRTC as well. Given IR and RRTS have similar application, we suggest to have common network for these two systems. This would have two benefits:

- complete re-use of spectrum & infrastructure.
- devices used would also be common between these two networks, helping build economies of scale.

Regarding block size, since the demand of NCRTC is of 5 MHz, the same should be allocated to them. Also since 5MHz has been found to be sufficient for IR application, and the same spectrum (same spots) can easily be used by NCRTC. At any point of time, there would be only one of the train systems generating traffic on the tracks - hence 5MHz would be effectively used between RRTS & IR application. In fact, infrastructure deployed by NCRTC can be used by IR and vice versa.

However, for any reasons, and if at all any additional spectrum is required to be given to NCRTC, then it should be done in other bands.

There are various sub-GHz options available through which NCRTC/ IR's requirements of low bandwidth and high coverage could be met. Such **bands available for use by Indian Railways, NCRTC and any other rail agency** are 150MHz, 300MHz, 400 MHz, and should be considered in first instance in order to avoid undue costs, technical complexities and missed economic opportunities.

Several countries such as **Japan have allocated 400 MHz band** for RSTT since the 1960s. Japan has been experimenting with the 44 GHz band and they have launched a system to be deployed in this band for RSTT maintenance services (using voice and data).

China has also deployed its RSTT system in 450 MHz band over its 80000Kms lines and proposed evolution of FDD LTE based RSTT system currently tested in this band.

In Australia, Telstra has been supplying railway communications to the Australia Rail Track Corporation using its 850 MHz spectrum and has plans to upgrade to 4G using its 700 MHz network.

Thus, in case the stalemate continues between the two railways agencies, and a separate block of spectrum is to be assigned to NCRTC, then it should be allocated in the 450-470 MHz. This would help mitigate the complexities of interference planning between public mobile networks and RSTT applications.

We re-iterate that given the importance of 700 MHz band for rural coverage of broadband, we not in favour of any further allocation of spectrum to NCRTC in this band.

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3. Do you see any challenge, if the same spectrum is assigned to different RRTS/metro rail networks, operating in geographically separated areas/corridors in the country? If yes, kindly provide details and possible solutions.

Airtel Response: No.

We do not see any such challenge if the same 700MHz spectrum (and spots) given to IR is shared with NCRTC/RRTS/metro rail networks. In-fact, this has been corroborated by the report enclosed in TRAI's extant consultation, given by a group of eminent experts that states that co-existence is possible between IR & NCRTC in the 5 MHz block already assigned to IR. The first preference should be to efficiently utilize this block and the same should be shared by IR with the NCRTC.

We see no reasons why IR would not like to share the same spectrum with NCRTC in non-overlapping areas. As regards very limited areas of operations where IR and NCRTC tracks may overlap, thus risk of interference, both the agencies can, and should deploy appropriate filters and tools to mitigate such risks. In-fact it is a natural expectation that users ensure co-existence, which, rather simply should be much easier to coordinate given both agencies operate under same ministry.

Again, the experts in their report have mentioned that for assignment of same spectrum to different RRTS/metro rail networks, which are operating in geographically separated manner such that, there is no interference, it can be easily done without any complications.

The same spectrum can easily be assigned to RRTS/ Metro which has been assigned to Indian Railways, if the geographical area of new RRTS/metro rail network is different and away from Indian Railways rail network.

The report also mentions that in case more than one RRTS Metro/rail networks are to operate on same spectrum frequencies in overlapping geographical area, the RRTS Metro/rail networks may share the Radio Access Network (RAN) in the overlapping area, which is known as Multi-Operator Core Network (MOCN). The Authority has already noted the point and the same has already been implemented in South Korea.

Here, we suggest single network (including PLMN and infrastructure) to be deployed using already allocated 5MHz of spectrum in 700 band. Spectrum allocated to IR can be used by NCRTC to build the sites around their corridors and the same network, spectrum, PLMN can be used by IR in future. Correspondingly, if IR deploys wider network (beyond RRTS corridor), the same can be used for expansion of RRTS. Single network can be deployed by Railtel along-with leveraging active & passive infra of existing cellular operators as well.

Since options are available for all scenarios, the endeavor of the Government, in light of efficient utilization of spectrum, should be to assign same spots to all such users. Suitable terms and conditions should be defined so that the users are aware of these scenarios right from the beginning and are able to design their networks/ solutions accordingly.

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4. In case more than one RRTS Metro/rail networks are to operate in overlapping geographical areas, will it be appropriate for RRTS Metro/rail networks to share the Radio Access Network (RAN) in the overlapping areas using Multi-Operator Core Network (MOCN)?

Airtel Response: Yes. As suggested previously, a single network should be build using 5MHz of 700MHz band spectrum. Devices from both of the network - RRTS and IR can use the same PLMN. Their application servers or APN can be different, which would help routing the traffic from the single core network towards application servers of RRTS and IR respectively.

5. In case it is decided that RRTS Metro/rail networks may share the Radio Access Network (RAN) in the overlapping area using Multi-Operator Core Network (MOCN), what should be the commercial terms

Airtel Response: Single network to be built for both RRTS and IR by agency say Railtel. It should provide subscriptions to both of these network users on per user or traffic from respective systems.

Alternatively, the TSPs can be allowed to build and offer the necessary network capabilities on mutually negotiated commercial terms.

6. What should be the permission/licensing regime for operation of wireless networks for NCRTC and other RRTS/metro rail networks? Kindly justify your response with justification.

AND

7. What should be the broad terms and conditions, which may be included in the Permission/License. Kindly provide detailed response with justification.

Airtel Response: Current licensing regime for spectrum allocated to IR in 700MHz band should be applicable for the NCRTC as well. In case for serving the needs of LTE based RSTT, alternate suggested bands (as indicated in response to Q1 above) are to be assigned (e.g. 450-470MHz), the same T&Cs may be extended for those bands as well.

The license conditions of such licensees need to clearly state that the spectrum is to be used for the intended use and not for any commercial activity directly or indirectly. It is submitted that the provision of Voice/ Internet services is part of the access licenses/authorization issued to TSPs/ISPs.

If any entity needs these or similar other commercial services, then that should be provided by the authorised licensees (TSPs/ISPs) similar to the provision of In-flight connectivity. The In-flight service providers use the Infrastructure of TSPs to provide the In-flight communication /Internet services. The same model may be replicated for Railways/ RRTS, etc. too in case the intention is to provide voice/ internet to the onboard passengers.

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8. Would it be appropriate if the spectrum be allocated on the same analogy as Indian Railways, for the same reasons as argued by DoT? If not, what should be the spectrum charging mechanism for spectrum that will be assigned to NCRTC? Kindly provide detailed response with justification.

9. Whether the terms & conditions and spectrum charges that will be applicable for NCRTC, should be made applicable to the other RRTS/Metro rail networks that may come up in future? If no, what terms & conditions and spectrum charges should be made applicable for the other RRTS/Metro rail networks? Kindly justify your response.

Airtel Response: We agree that there must be some reasonable administrative usage recovery mechanism for making use of spectrum by Railway segment, even if for the captive signaling purposes, especially given that these entities are commercial enterprises, **thus have the mechanism to recover the cost of spectrum from their end-users.**

Giving spectrum free of charge and not recovering the cost of administering its allocation and management, will only make the use inefficient. To that extent we believe that IR/NCRTC or similar users should pay for spectrum allocation and fairly contribute towards exchequer.

10. Any other issues/suggestions relevant to the subject, may be submitted with proper explanation and justification.

Airtel Response:

Provide clear spectrum roadmap for Railways and similar new users – Now evidently there is increasing demand of spectrum from Railways, NCRTC/RRTS which is likely to further accelerate from similar users like Metros, Highspeed rails. Hence it becomes critical that a proper demand estimation study is done by the Authority and DoT for such users for at-least needs of next decade, and, appropriate new non-IMT bands are identified and allocated/assigned for such purposes. This will offer the following advantages:

- Long term planning for IR, NCRTC, other similar Railways entities
- Mitigate and de-risk the spectrum needs of mobile networks operators/TSPs
- Mitigate risk of exclusion of rural/semi-urban users from not having broadband coverage in critical sub-GHz/700MHz band
- Railways/ RDSO and OEMs can invest in R&D and plan ahead equipment in newer bands specifically identified for such users.
- Save huge time, efforts and costs in coordination, consultations on same or almost similar issue, thereby reducing complexity, ambiguity in entire process.
