ncrtc

राष्ट्रीय राजधानी क्षेत्र परिवहन निगम
(भारत सरकार एवं प्रतिभागी राज्य सरकारों का एक संयुक्त उपक्रम)
National Capital Region Transport Corporation
(A Joint venture of Government of India and participating State Governments)

गति से प्रगति

No: NCRTC/DS&O/DoT/31　　　　　　　　　　　　**Date: 05/07/2022**

To
The Under Secretary,
Govt Of India,
322-C, Nirman Bhawan,
New Delhi

Kind Attn. : Sh. Sunil Kumar, Under Secy to Govt. of India

Subject : Allotment of frequency spectrum to NCRTC for implementation of Train Control System for Regional Rapid Transit System-Reg

Reference:

　　1. MoHUA (MRTS-I) Letter No K-14011/7/2018-MRTS-I dated 30/06/2022
　　2. TRAI Letter No C-15/2/(2)/2021-NSL-II dated 23/06/2022

TRAI has released a consultation paper on 09/06/2022 wherein issues related to assignment of spectrum to NCRTC and other RRTS Metro/Rail Networks have been raised.

Vide reference (1) above, Ministry of Housing and Urban Affairs has asked for furnishing comments over issues related to assignment of spectrum (in 700 MHz Band) to NCRTC and other RRTS Metro/Rail Networks from various Metro Rail Organisations of India.

The responses against the raised questions regarding the subject matter are being attached along with this letter.

भारतीय दूरसंचार विनियामक प्राधिकरण
महानगर दूरसंचार भवन, नई दिल्ली-०२
पंजीकरण सं. 12293
0 5 JUL 2022
ई आफिस सं.

For NCRTC

Sd/-

Dayanand
GGM/S&T-II

Enclosure:

1. Responses against the queries raised by TRAI

Copy To:

1. Sh. V. Raghunandan, The Secretary, TRAI, Email: secretary®trai.gov.in
2. Sh. Tausif Abbas, Advisor (Networks, Spectrum and Licensing), TRAI, Email: advmn@trai.gov.in

Dayanand
GGM/S&T-II

●●ncrtc.in

Telecom Regulatory Authority of India (TRAI)

Consultation Paper

Spectrum Requirements of National Capital Region Transport Corporation (NCRTC) for Train Control System for RRTS Corridors

June 2022

Response Submitted by:

National Capital Region Transport Corporation

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PREAMBLE

To promote sustainable and balanced growth in National Capital Region (NCR), the NCR Planning Board (NCRPB) prepared a 'Functional Plan on Transport for National Capital Region-2032', which recommended development of multimodal transport system for NCR with special emphasis on dedicated rail based high-speed, high-frequency RRTS for connecting regional centres in NCR. The erstwhile Planning Commission of India (now NITI Aayog) appointed a Task Force (in the year 2006) under the chairmanship of Secretary erstwhile Ministry of Urban Development (now Ministry of Housing & Urban Affairs - MoHUA), which identified eight corridors and **prioritized three corridors - Delhi-Meerut, Delhi-Panipat and Delhi-Alwar for implementation in the phase I of RRTS.**

Accordingly, Government of India joined hands with four State Governments; Delhi, Uttar Pradesh, Haryana and Rajasthan to create a joint venture company - National Capital Region Transport Corporation ('NCRTC') in the year 2013 under the Company Act, 1956. The Government of India (GoI) holds 50% share and the State Governments of the National Capital Territory (NCT) of Delhi, Haryana and Rajasthan hold 12.5% share each in National Capital Region Transport Corporation (NCRTC) %), under the administrative control of Ministry of Housing & Urban Affairs (MoHUA). NCRTC is mandated for designing, developing, implementing, financing, operating and maintaining RRTS projects in the NCR. RRTS comes under the Legal and Regulatory Framework of Metro Railway (Construction of Works) Act 1978, and Metro Railways (Operation and Maintenance) Act 2002.
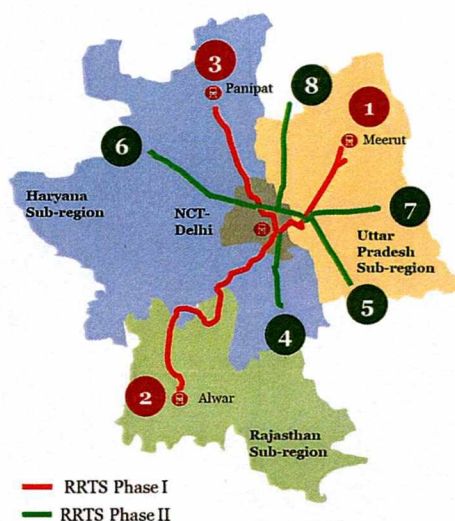
RRTS is a new, transformational and strategic regional development intervention of Government to empower citizens through access to education, healthcare, employment and economic opportunities. The three prioritized RRTS projects have been included in the **National Infrastructure Pipeline (NIP), finalized by Department of Economic Affairs (DEA)** and unveiled by Hon'ble Finance Minister. Furthermore, the prioritized RRTS corridor are part **of 'Comprehensive Action Plan' (CAP) for Air Pollution Control in Delhi & NCR'** and recommendation of **'High Powered Committee on Decongesting Traffic in Delhi'.**

RRTS is a first-of-its-kind, rail-based, high-speed, high-frequency regional transit system with a design speed of 180 kmph and with all stoppages average speed close to 100 kmph (more than 3 times of metro rail). Being implemented for the first time in India, RRTS, once operational, will be the fastest, most comfortable and safe mode of commuter transport in

NCR. RRTS aims to improve quality of life of people by providing equitable, fast, reliable, safe comfortable, efficient & sustainable mobility solutions enabling economic development of NCR.

Some of the salient features of RRTS are as follows:

- Design Speed of 180 Kmph and average Speed close to 100 Kmph
- Train every 5 – 10 min
- Interstation distance is between 5 to 10 km
- Safe and reliable service
- Interoperability: All the 3 RRTS corridors will converge at Sarai Kale Khan and will be inter-operable
- Multimodal integration with Indian Railways, Delhi Metro and ISBT/UPSRTC, Airport

India's first regional rail, Delhi-Ghaziabad-Meerut RRTS corridor was sanctioned by Government of India in March 2019. Foundation Stone for the project was laid by Hon'ble Prime Minister of India on 8th March 2019. The corridor is approximately 82 km long corridor with 25 stations, which will cover the distance from Sarai Kale Khan in Delhi to Modipuram in Meerut in less than 60 minutes. The civil construction work on the entire corridor is in full swing and on schedule. The first priority section of 17 km will be operationalized for public carriage in December 2022. The complete RRTS corridor is to be commissioned by March 2025. The Key features of the Delhi-Meerut RRTS Corridor are as given below:

- Corridor length about 82.15 km
  - o Elevated – 69.79 Km
  - o Underground – 12.36 km
- 25 Stations (16 RRTS, 9 MRTS)
- Besides regional Services, RRTS infrastructure will also be used to operate Local Transit (Metro) Services in Meerut over 21 km with 13 Stations.

We welcome the opportunity to submit our views on the Consultation Paper **"Spectrum Requirements of National Capital Region Transport Corporation (NCRTC) for Train Control System for RRTS Corridors", dated 09th June 2022, by Telecom Regulatory Authority of India (TRAI)**. We are providing a detailed response to the queries raised in the Consultation paper.

We look forward to work closely with TRAI in a continuous manner for deriving an inclusive approach for spectrum allocation and network deployment strategy to meet the requirements of stakeholders. NCRTC hopes that our suggested method can form the basis for deriving appropriate recommendations by the Authority.

NCRTC'S COMMENTS ON ISSUES MENTIONED IN THE CONSULTATION PAPER

1. In which band, spectrum should be assigned to NCRTC for their LTE-R technology-based Train control system for RRTS rail corridors?

5 MHz (paired) spectrum in 700 MHz band should be allotted to NCRTC. The supporting rationale for the above suggestion as follows:

i. NCRTC had been in constant communication with DoT and Railway Board since November 2019 for allocation of spectrum for captive use to meet public safety and security requirement. The issue of requirement and allocation of spectrum in 700 MHz band was deliberated from the very beginning. With reference to the 'In principle approval of Broad Technologies for Regional Rapid Transit System (RRTS)' from Railway Board vide letter dated 30.09.2020 for using 700 MHz (LTE) band is approved for communication backbone (Annexure 1). This is in line with Metro Railway (Construction of Works) Act 1978, and Metro Railways (Operation and Maintenance) Act 2002. To honour the project deadlines, set by the MoHUA (Government of India), the Signalling & Telecom package had to be awarded by 2020. Based on the approval from Railway Board, the tender specifications were drafted for 700 MHz Band. Hence, all the planning, designing and procurement of equipment has been done according to 700 MHz.

ii. It is understood that Secretary, MoHUA has brought to the notice of Secretary, DoT, that the issue of spectrum allocation to NCRTC was considered by the Empowered Technology Group (ETG) in January 2021, and it was recommended that spectrum in 700 MHz Band is appropriate for mission critical railway application.

iii. Leveraging the inherent advantages such as wide coverage, low Capex, efficient network utilization, the adoption of 700 MHz frequency spectrum is growing across world's railways. Moreover, high speed, low latency, low setup time, and high-security data connectivity offered by LTE Network in 700 MHz band, makes it most suitable for mission critical communication for safety and security application on RRTS. Similar observations were mentioned in TRAI Recommendations on Allotment of Spectrum to Indian Railways for Public Safety and Security Services dated 25.10.2019.

iv. Vendor ecosystem is available in 700 MHz band for Radio Access Network and User Equipment (Train Radio, Handheld and Fixed Radio Terminals).

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?

Indian Railways has been allocated 5 MHz (paired) spectrum in 700 MHz band for same mission critical railway applications. Hence NCRTC should be allotted 5 MHz spectrum in 700 MHz band.

The supporting arguments for 5 MHz paired spectrum
i. Considering the capacity inputs of 700MHz Band, 5MHz of spectrum, PDSCH Loading (DL) 50% and UL Interference margin of 2dB, the NCRTC's network is designed with the following considerations:
   1) 300 connected UEs per sector.
   2) Fifteen (15) actively transmitting MCPTT users per sector (group calls or private calls), all modelled at the cell edge and 300 receiving MCX users evenly distributed within the sector.
   3) Minimum four (4) active ETCS sessions/instance per 1 km of track length, per track.
   4) Minimum One (1) active on-board CCTV stream per Train, which shall be modelled along the rail route and at the cell edge.

The table below provides the throughput requirements per sector for NCRTC:

Services	UpLink throughput requirements (kbps)	Users	Total Uplink throughput requirements (kbps)	Reference document
MCPTT	25 kbps	15	375 kbps	3GPP Spec *TR 126 989 - V16.0.0 - LTE; Mission Critical Push To Talk (MCPTT); Media, codecs and Multimedia Broadcast/Multicast Service (MBMS) enhancements for MCPTT over LTE (3GPP TR 26.989 version 16.0.0 Release 16) (etsi.org)*
ETCS signalling	10 kbps	8	80 kbps	ETCS Spec *ETCS over GPRS/Edge capacity study in station environment (ERTMS objective 1 & 2) (uic.org)*
Rolling Stock Health Monitoring	1000 kbps	1	1000 kbps	RDSO Draft Technical Advisory Note Aug 2021 *Final Draft TAN on Implementation of LTE on Indian Railways.pdf*
On-Board Surveillance	500 kbps	2	1000 kbps	RDSO Draft Technical Advisory Note Aug 2021 *Final Draft TAN on Implementation of LTE on Indian Railways.pdf*
Trackside Health Monitoring (IoT)	56 kbps (lower end)	10	560 kbps	Narrow Band-Internet of Things Specification *NB IOT Peak Data Rate Calculation - Narrow Band IoT - Techplayon*
Total Throughput Requirement (kbps)			3015 kbps*	

* As per 3GPP calculation (TS 36.213) 5 MHz bandwidth is required for 3 Mbps uplink throughput on cell edge

ii. NCRTC use cases are same as Indian Railways both being mission critical rail-based system for public safety and security services.

Also, in this regard may kindly refer to TRAI recommendation dated 25.10.2019 Chapter-III, para 3.1 (a) "*Out of the 35 MHz (paired) spectrum available in 700 MHz band, 5 MHz (paired) spectrum may be allocated to Indian Railways for implementing ETCS Level-2, MC PTT + Voice, IoT based asset monitoring services, passenger information display*

system and live feed of Video Surveillance of few coaches at a time. The remaining 30 MHz (paired) in 700 MHz band may be put to auction in the forthcoming auction."

Hence 5 MHz spectrum will also be required for NCRTC operational requirements.

iii. Further the requirement is in line with/ less than other global railway deployments

Country	Radio Communication Standard	Specific Name	Frequency Range	Data Rates (kbps)
South Korea	TTA.KO-06.0438	LTE-R	UL: 718- 728 DL: 773- 783	DL: 75000 UL: 37000
Australia	3GPP LTE-A	DTRS	UL: 1770- 1785 DL: 1865- 1880	DL: 110000 UL: 38000
Bangladesh	3GPP LTE-A		2575- 2585 (TDD)	
America	3GPP	FirstNet	UL: 758 - 768 DL: 788 - 798	

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.**

   a) **Assignment of same spectrum for RRTS/Metro rail networks which are geographically separated area**

   No challenges are foreseen in geographically separated regions.

   b) **Assigning same spectrum to more than one RRTS Metro/rail networks operating in the overlapping geographical area**

   In this regard a study has been conducted by IIT Chennai on sharing of spectrum by different railway organizations in 700 MHz band. The report is part of the present consultation paper. The recommendation and observations made there upon are also relevant for sharing of spectrum between RRTS and Metro Rails.

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)? Any other feasible mechanism for using same spectrum in overlapping areas may also be suggested with detailed explanation. Kindly justify your response.**

   MOCN is proven technology for RAN Sharing in Public Network. At present there is no RAN sharing using MOCN for Mission Critical Networks such as Railways in India. However, information is available in public domain regarding MOCN technology being used in South Korea for Mission Critical Railway application. References to this technology is available in the TRAI recommendation dated 25.10.2019 and current consultation paper.

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),

   a) Whether it should be included in the terms and conditions for assignment of spectrum that the assigned spectrum may have to be shared with other RRTS/Metro rail networks to whom government decides to assign the same spectrum frequencies on sharing basis?

   b) Whether certain guidelines for coordination mechanism need to be issued or it should be left to the mutual agreement between the RRTS/Metro rail network operators mandated for MOCN RAN sharing? In case, guidelines need to be prescribed, kindly suggest the points to be included in the guidelines.

   c) Whether commercial arrangements between two RRTS/Metro rail networks for RAN sharing needs to be regulated or left to the mutual arrangement?

   d) Whether any other conditions need to be prescribed for such RAN sharing? Kindly provide detailed justifications.

   a) This is a policy matter to be decided by Govt. of India.

   b) Coordination mechanism may be decided through Mutual Agreement.

   c) Commercial arrangement may be decided through Mutual Agreement .

   d) In case of disagreement, MoHUA (Nodal Ministry for RRTS & Metro Rail) may govern the terms and conditions of RAN sharing between RRTS & Metro Rail

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.**

   NCRTC services are for captive use similar to that of Indian Railways. Hence same policy as adopted for Indian Railways for permission/licensing regime for operation of wireless networks may be made applicable for NCRTC. No commercial business for telecommunications services will be done over NCRTC's captive LTE Network.

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

   NCRTC services are for captive use similar to that of Indian Railways. Hence same terms and conditions as adopted for Indian Railways for permission/licensing of captive wireless networks may be made applicable for NCRTC. Moreover, it is a policy matter to be decided by Govt. of India.

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.

As the use case of RRTS and Indian Railways is identical, hence the spectrum allocation may be made on the same analogy as that of Indian Railways.

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.**

It is a policy matter, however for all similar captive networks like RRTS and Metro Rail the same terms and conditions and spectrum charges shall be applicable.

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

No suggestion

GOVERNMENT OF INDIA
MINISTRY OF RAILWAYS
(RAILWAY BOARD)

No. 2018/Proj./NCR/14/1 Pt.

New Delhi, dated 30.9.2020

Managing Director,
National Capital Region Transport Corporation,
(NCRTC), 7/6, AMDA Building,
Siri Fort Institutional Area,
August Kranti Marg,
New Delhi-110049

Sub: In principle approval of Broad Technologies for Regional Rapid Transit System (RRTS).

Ref: i) NCRTC's letter no. NCRCTC/DM/EDD/RDSO/1 dated 26.5.2020 and 11.09.2020

   ii) Board's letter of even no. dt. 11.5.2020 and 30.7.2020

   National Capital Region Transport Corporation (NCRTC)'s proposal for Broad technologies for Regional Rapid Transit System (RRTS) as submitted vide its letters dated 26.5.2020 and 11.09.2020 has been examined in Railway Board and in principle approval of Board is hereby conveyed for the following as under.

BROAD TECHNOLOGY FOR SIGNALLING & TELECOMMUNICATIONS SYSTEMS (Annexure B)

S.N	Description	Minimum requirement
1	Type of Signalling	Cab Signalling, ETCS Level 2
2	Backup ATP	ETCS Level 1 (optional)
3	Backup Signalling	Through manual operation procedure with Marker Board at entry and exit at all stations
4	Interlocking	EI
5	Train Control System	ETCS Level 2-ATP, Hybrid Level 3 functionality (Optional), ATS, (ATO GoA 2 is optional)
6	Type of Train Detection	Axle Counters
7	Point machine	
	i)For Main Line	i) Non-Trailable high trust, high performance point machine
	ii) For Depot	ii)Trailable/ Non-Trailable high trust, high performance point machine
8	Redundancy on On-Board, Track sight and Communication backbone	Yes (Hot standby)
9	Communication Backbone	LTE (700 MHz)

30|09|2020

PSD systems

S.N	Description	Minimum requirement
1	Platform Screen Door	PSDs of half/full height (Optional), Half Height PSD - 1.5 M or higher Interfaced with On-board Signalling system

The proposed Signalling and Telecom Scheme of NCRTC is approved for implementation on NCRTC subject to :-

1. The Train operations on NCRTC shall be with ETCS Level-2 or with ETCS Level-1 (optional) as back up Automatic Train Protection (ATP) system. In case, the ATP system is not functional, train operation shall be governed as per Manual operation procedures mentioned in operating Manual & General Rules on NCRTC.

2. LTE Communication Backbone- On parallel alignment with IR, there shall not be any interference in the radio frequency of LTE or GSM (R) system of Indian Railways, Suitable Interference prevention system needs to be provided suitably by NCRTC.

3. PSD System should be provided on similar lines as on Metros & Interfaced with Onboard Signalling System.

4. Minimum requirements Conventional Telecommunication System suggested by General Consultant AIAI-GC as Integrated System with; Data Transmission System, CCTV, Master Clock System, PA & PIDS systems, Telephone system, SCADA system, Access Control Detection System, Centralized Voice recording system should be provided.

5. Regarding ETCS Hybrid level-3 functionality, which is proposed to be introduced for the first time in the country, necessary safety approvals and safety certification by Independent Safety Assessors (ISAs) included in the panel approved by Indian Railways, shall be ensured.

6. The procedure for Safety Certification and Technical Clearance of Regional Rapid Transit System (RRTS) July 2020 approved by Railway Board shall be followed.

30/09/2020

Broad technology for traction (OHE) & power supply

(Annexure C)

Based on document submitted by NCRTC, the approved broad technology for traction (OHE) & power supply (Annexure C) are as under:

i. Incoming Supply from Power Supply Authority (PSA) through 66 kV/220 kV Single Core EHV Cable.
ii. RSS/AMS/TSS shall be
      (i)   66 kV/220kV GIS type RSS,
      (ii)   (ii) 33 kV GIS/AIS type AMS &
      (iii) (iii) 25 kV GIS type TSS respectively.
iii. Design Speed shall be 180 kmph.
iv. Power Supply to Rolling Stock shall be 1x25 kV, 1-Phase, 50 Hz AC with
    (a) flexible OHE on elevated and at grade section and
    (b) rigid OHE (ROCS) in tunnel section.
v. Power Supply to Stations: RRTS stations through Ring Main System at 33 kV in underground section and elevated section.
vi. Control and Command shall be through SCADA system for local control at RSS through Substation Automation on IEC 61850 and remote control from OCC/BCC.
vii. Testing and commissioning of Traction System shall be done as per standards:

    a. IEEE-81 : Earthing System Pre-commissioning Test.
    b. IEC 61936 : Electrical Clearance.
    c. EN 50317 : Current Collection Test.
    d. EN 50119 : OHE Acceptance Test.
    e. IEC 61850 : Relay Communication.
    f. IEC 60870 -5-104 : SCADA communication.
    g. EN 50149 : For Fixed Installations Copper Contact Wire.

30/09/2020
(D.K Mishra)
Director/MTP
Railway Board
☎ 011-47845480