



भारत सरकार Government of India
रेल मंत्रालय Ministry of Railways
रेलवे बोर्ड (Railway Board)



सं. 2019/Tele/8(1)/2(3295990)

नई दिल्ली, दिनांक: 06.03.2024

OFFICE MEMORANDUM

Sub.: Consultation Paper on Assignment of Additional Spectrum to Indian Railways for its Safety and Security Applications

Kindly refer to the aforementioned Consultation Paper dated 07.02.2024 seeking comments from the stakeholders.

2. Indian Railways being the principal stakeholder in the matter, item-wise views of Ministry of Railways are enclosed herewith.

Encl.: as above.

राजित
6/3/24

(रणजीत कुमार)

कार्यकारी निदेशक (दूरसंचार विकास)

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Indian Railways' comments on Consultation paper 01/2024 on Assignment of Additional Spectrum to Indian Railways for its Safety and Security Applications

I/3090453/2024

S.N.	TRAI's Question	Railway's Comments
1	Q1. Whether an additional 5 MHz (paired) spectrum in the 700 MHz band should be assigned to Indian Railways (IR) in order to meet its requirement for safety and security applications? Kindly provide a detailed response with justification	<p>A1. In order to provide a reliable optimum communication network with high level of operational availability on IR for safety and security applications, IR needs at least 10 MHz spectrum in 700 MHz band (Band-28) free of cost as this proposal is devoid of any commercial gain, but only for enhancing safety of trains, security of passengers, disaster management and IOT based assets monitoring.</p> <p>The challenges of Indian railway LTE requirements are different from public telecom operators as well as other highly structured train operations being run by Metro railways. The same is elaborated as:</p> <ol style="list-style-type: none"> 1. Indian railway is a 24 x 7 x 365 operation spread across the entire geography of India. 2. The involved railway operation teams are always on ground supervising track, rolling stock, electrical and Signaling assets. 3. As per cabinet note, LTE is to support to the current and future data and voice needs for Modern Signalling and Train Protection Systems, Train-Ground and Train-Train communication, Passenger safety & security services, Internet of Things (IOT) based remote asset monitoring & management services and transmission of live video feed of CCTV cameras in coaches. Proposed LTE network will become the communication backbone for the same. Any performance degradation will have impact on train operations. 4. The network needs to be highly reliable and dependable for users to be able to grow sufficient confidence in the system. This implies that the




network needs to be designed for reliability with suitable life-cycle governance in place.

Indian railway was allotted a bandwidth of 5 MHz in band 28 against the requested requirement of 10 MHz suggesting that an alternative technology / spectrum can be utilized for backhauling the CCTV video use cases & other applications.

Accordingly, Indian Railways created a traffic model for typical LTE sector for 5 MHz Bandwidth to cater Mission Critical Services as well as limited CCTV video use cases.

In Indian Railways' scenario where UE in mobility mode, Cell capacity UL/DL throughout availability, requirement, catered and shortfall is depicted as:

(i) Scenario when Railway has 5 MHz spectrum
Mission Critical Services (in Kbps)

Application	Availability	Requirement		Catered	Shortfall
		DL	UL		
KAVACH	Average	100	100	100/100	
MC PTT + Voice	throughput	1600	1600	1600/1600	
EoTT & DPCS	7000 Kbps in D/L and 3000 Kbps in U/L	300	300	300/300	
IoT Services		2000	2000	2000/500	-/1500
On Board Video Surveillance		200	40000	200/500	-/39500
Total	7000/3000	4200	44000	4200/3000	-/41000

(i) Scenario when Railway has 10 MHz spectrum
Mission Critical Services (in Kbps)

Application	Availability	Requirement		Catered	Shortfall
		D/L	U/L		
KAVACH	Average	100	100	100/100	
MC PTT + Voice	throughput	1600	1600	1600/1600	
EoTT & DPCS	18000 Kbps in D/L and 6500 Kbps in U/L	300	300	300/300	
IoT Services		2000	2000	2000/1000	-/1000
On Board Video Surveillance & Video Streaming for disaster incidences		4200	40000	4200/3000	-/37000
Passenger information display system		100	10	100/10	
Data uses for		4700	1700	4700/490	-/1210

other safety,
security & train
operations
applications

Total	18000/6500	13000	45710	13000/6500	-/39210
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Note-The above railway's requirement even does not meet with throughput given by 10 MHz. Hence, it is imperative to request for at least 10 MHz spectrum to Indian Railways on its need basis.

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Q2. In case your response to Q1 is negative, -

(a) In what manner, the requirement of IR for its safety and security applications may be fulfilled? Specifically, whether it would be appropriate to devise a framework, under which the 10 MHz (paired) spectrum [5 MHz (paired) assigned to IR, and 5 MHz (paired) reserved for NCRTC and other RRTS/ Metro rail network] in the 700 MHz band may be used by all types of rail networks on shared basis, subject to the outcome of the field trial recommended by the Authority in its recommendations on 'Spectrum Requirements of National Capital Region Transport Corporation (NCRTC) for Train Control System for RRTS Corridors' dated 28.12.2022? If yes, please suggest the key features which should be included in such a framework?

Any other suggestion may be provided with detailed justification.

(b) In case your response to Q(2)(a)(i) is affirmative, whether a frequency spectrum of 10 MHz (paired) in the 700 MHz band would be sufficient to meet the requirement of different rail networks in India particularly in the overlapping zones? Kindly provide a detailed response with justification.

A2. Not Applicable

3 Q3. In case it is decided to assign an additional 5 MHz (paired) spectrum in the 700 MHz band to IR, whether there is a need for harmonization of spectrum in the 700 MHz band to make the spectrum assigned to IR, and NCRTC and other RRTS/ Metro Rail Networks contiguous? Kindly

A3. Yes, for optimum utilization of network, getting maximum throughput and ease of maintenance of the system, contiguous 10 MHz (Paired) spectrum is needed. Over and above, some advantages for Contiguous spectrum is as under:

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	provide a detailed response with justification.	<p>(I) Contiguous spectrum of 10 MHz will have better interference mitigation at loading condition in overlapping areas with wide radio grid of 50 RBs.</p> <p>(II) Contiguous spectrum will have lesser overhead control channel consumption.</p> <p>For deployment of non-contiguous spectrum allocations, there are a few implications:</p> <p>(i) If the full spectrum allocation in a band is to be operated with a single base station, the base station has to be capable of operation in non-contiguous spectrum.</p> <p>(ii) If a larger transmission bandwidth is to be used than what is available in each of the spectrum fragments, both the UE and the base station have to be capable of handling non-contiguous carriers in that band.</p> <p>(iii) When carrier aggregation is used there are a number of serving cells, one for each component carrier. The coverage of the serving cells may differ, for example due to that component carrier (CCs) on different frequency bands will experience different path loss.</p>
4	<p>Q4. Should a uniform spectrum charging methodology be adopted for Indian Railways as well as for NCRTC and other RRTS/ Metro rail networks? If yes, which of the following spectrum charging methodology be adopted in this regard:</p> <p>i Spectrum charging methodology based on Auction Determined price (ADP) as recommended in the TRAI's recommendations on 'Spectrum requirements of National Capital Region Transport Corporation (NCRTC) for train</p>	<p>A4. Indian Railways has requested to provide the spectrum free of cost because it is required for safety and security of passengers & train operations & has no commercial utilization. Finance Ministry vide its letter no. 14/6/2018-IPP dated 08.10.2018 had also recommended the same.</p> <p>The NCRTC is a joint partnership institution between the Central Government and the participating states of Uttar Pradesh, Haryana, Rajasthan and the NCT of Delhi & hence recommendation cannot be concretely made without knowing details of their business model.</p>

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	<p>control system for RRTS corridors dated 28.12.2022.</p> <p>ii Spectrum charges as levied for Indian Railways as per DoT's Order No. P-11014/34/2009-PP(II) and P-11014/34/2009-PP(IV) dated 22nd March 2012 (revised vide DoT's Order dated 11.12.2023).</p> <p>iii Apart from the methodologies highlighted in (i) and (ii) above, any other uniform spectrum charging methodology that may be adopted in this regard? Details with justification may kindly be provided.</p>	<p>2019/Tele/8(1)/2</p> <p>The allotment of frequency spectrum is proposed for Public Safety & Security Services for Rail passengers. It is not intended for any commercial use. As Indian Railway is being operated by Ministry of Railways, Government of India and the amount paid by Railways will also be charged to Consolidated Fund of India, therefore, allotment of 10 MHz (paired) spectrum (5 MHz additional as demanded as well as 5 MHz already allotted to Indian Railways) in 700 MHz frequency band is sought free of cost.</p>
5	<p>Q5. If answer to Q4 above is no, whether the existing charging methodology as per DoT's Order No. P-11014/34/2009-PP (II) and P- 11014/34/2009-PP(IV) dated 22nd March 2012 (revised vide DoT's Order dated 11.12.2023) be continued for Indian Railways or some other spectrum charging methodology may be adopted specifically for Indian railways? Please provide detailed response with justification.</p>	<p>A5. Not Applicable</p>
6	<p>Q6. If a spectrum charging methodology similar to NCRTC and other RRTS/Metro rail networks, is adopted for Indian Railways, what should be the payment terms and associated conditions relating to:</p> <p>Upfront payment</p> <p>Moratorium period</p> <p>Total number of installments to recover deferred payments</p> <p>Rate of interest in respect of deferred payment and prepayment.</p> <p>Please support your answer with detailed justification.</p>	<p>A6. Not Applicable</p>

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[Signature]

Q7. Any other suggestions relevant to the subject may kindly be made with detailed justification.

In addition to above, suggestions relevant to the subject are as under:

Advantages to Indian Railways: Assigning additional 5MHz will easy IR to implement state of art LTE based broadband communication back bone system with option to migrate to 5G, Commercially Available (Ecosystem) in 700 MHz band thereby enhancing the capacity to carry high speed data. Safety cannot be quantified in monetary terms as such it is not possible to undertake cost benefit analysis. Additional 5 MHz will be benefited to as

- 1.1 **Enhanced Spectral Efficiency:** Increasing the spectrum allocation to 10 MHz allows for improved spectral efficiency in the Kavach System. This expanded bandwidth facilitates higher data transmission rates and more robust communication capabilities. With the growing demands of modern railway operations, a wider spectrum ensures a smoother flow of signaling data and mission-critical voice communication, ultimately enhancing the overall efficiency of the railway network.
- 1.2 **Future-Proofing Infrastructure:** Anticipating the future growth of railway operations and the increasing reliance on advanced communication technologies, allocating 10 MHz instead of 5 MHz is a strategic investment in future-proofing the infrastructure. This ensures that the Kavach System remains adaptable to evolving technological requirements, supporting the railway network's expansion and integration of emerging technologies.
- 1.3 **International Best Practices:** Aligning with international best practices in railway communication systems, a 10 MHz spectrum allocation is consistent with the requirements of modern signaling and communication systems deployed in rail networks worldwide. This alignment promotes interoperability and compatibility with global standards, fostering

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		<p>seamless collaboration and information exchange in the international rail community.</p> <p>1.4 The request for an additional 5 MHz paired spectrum is grounded in the need for enhanced spectral efficiency, the establishment of a redundant network, future-proofing the infrastructure, and adherence to international best practices like South Korea which has allocated 10 MHz spectrum. This strategic allocation will contribute to the reliability, safety, and efficiency of Indian Railways' Kavach System and simultaneously meeting the security of passengers on board & at stations & all IOT applications of IR.</p>
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