

**Submission to the
Telecom Regulatory Authority of India
(TRAI):**

**Comments on
Consultation Paper on
Allotment of spectrum to Indian
Railways for Public Safety and
Security services**

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SAMSUNG



Table of Contents

- 1. EXECUTIVE SUMMARY.....1**
- 2. COMMENTS AND SUGGESTIONS2**
- 3. ACRONYMS AND ABBREVIATION.....6**
- 4. CONTACTS7**

1. Executive Summary

Samsung Electronics Co., Ltd (hereinafter Samsung) is pleased to submit a response to the Telecom Regulatory Authority of India (TRAI) consultation paper on “Allotment of spectrum to Indian Railways for Public Safety and Security services”¹. Samsung is grateful for the opportunity to work with the TRAI by suggesting methods for spectrum allocation to Indian Railways for enabling Railway Radio-communication Systems between Train and Trackside (RSTT) services. The TRAI consultation paper has captured the scenarios for spectrum allotment to Indian Railways quite comprehensively.

In section 2, Samsung provides comments and suggestions on the issue for questions listed in the consultation paper. Samsung fully supports the consultation by the TRAI to find alternate methods for administratively allocating spectrum to Indian Railways requirement for RSTT.

Samsung has proposed a harmonized approach for administratively allocating 2x10 MHz block size from 800 MHz spectrum band i.e. 3GPP Band 26 to Indian Railways along with Public Protection and Disaster Relief (PPDR) Special Purpose Vehicle (SPV) under Ministry of Home Affairs (MHA).

Samsung believes that deploying common communication network using Long Term Evolution (LTE) technology on harmonized spectrum for both RSTT and PPDR is best strategy in national interest of all stakeholders. This allows easy co-ordination, optimal spectrum usage, smooth scaling up and interworking between the two networks during disaster situation.

Samsung has demonstrated strong leadership in LTE technology through active participation in development of global standards and experience in successful implementation of LTE-R and PS-LTE networks for RSTT and PPDR services across the globe. In addition to mission critical services Samsung is leading infrastructure and End-to-End (E2E) solution provider for leading Telecom Service Providers (TSPs) for commercial networks based on LTE and 5G technology in United States, Korea, Europe, China, Japan and India.

Finally, Samsung would like to thank the TRAI for the opportunity to comment on the consultation issues, and we look forward to working closely with the TRAI in a continuous manner for deriving an inclusive approach for harmonized spectrum allocation and network deployment strategy to meet the requirements of stakeholders. Samsung hopes that our suggested method can form the basis for deriving appropriate recommendations by the Authority.

¹ https://main.traai.gov.in/sites/default/files/CP_SIR_24062019_0.pdf

2. Comments and Suggestions

In this section, Samsung provides detailed comments and suggestions for Issues for Consultation mentioned in Chapter 4 of the consultation paper.

Q.1 Whether spectrum in 700 MHz band should be assigned to Indian Railways for RSTT in India? Please provide justification for your response.

The 700 MHz Band [i.e. 713-748 MHz Uplink (UL) and 768-803 MHz Downlink (DL)] the entire spectrum shall be auctioned to Telecom Service Provider (TSP) according to the 1st August 2018 recommendations². This band also referred as APT700 or 3GPP Band 28, which is paired FDD spectrum of 2x35 MHz is available in all 22 Licensed Service Areas (LSA) within India. The Authority has recommended a block size of 5 MHz while bidding for the spectrum during the auctions by the (TSP). Considering the total availability of 35 MHz FDD spectrum, 3 private TSPs and one state TSP, the premium pricing of the spectrum, each TSP participating in auctions most likely would like to secure at least 2 blocks i.e. 10 MHz spectrum. Furthermore, 5G High Level Forum (HLF) has also recommended the 700 MHz band in the Announce Tier for 5G. For the TSPs to fulfil the National Digital Communication Policy (NDCP) 2018 objectives on Connect India Mission the 700 MHz band, which is a coverage band is very crucial. If 10 or 15 MHz is assigned to Indian Railways from the available 35 MHz then 20 to 25 MHz spectrum may not be sufficient for the TSPs to fulfil the NDCP 2018 objectives. Based on the TRAI and 5G HLF recommendation administrative allocation of 700 MHz band doesn't seem feasible for RSTT.

Q.2 In case your answer to Q1 is in affirmative, how much spectrum should be assigned to Indian Railways?

We do not provide specific comments, however, please refer to our response to Q.3.

Q.3 In case your answer to Q1 is negative, i) what are the other bands (including 450-470 MHz) in which spectrum can be assigned for RSTT, ii) how much spectrum should be assigned to Indian Railways?

Samsung recommends 2x10 MHz block size from 800 MHz spectrum band i.e. 3GPP Band 26 should be assigned to Indian Railways. The Indian Railways requirement of 10 MHz spectrum for RSTT can be met in 800 MHz band. The 800 MHz band has similar radio propagation characteristics as 700 MHz band. According to 4th June 2018 recommendations on Next Generation Public Protection and Disaster Relief (PPDR) communication networks³, the authority has recommended 2x10 MHz spectrum of 3GPP Band 26 on no-cost basis for LTE based nationwide broadband PPDR network. This band also referred as PPDR band or 3GPP Band 26 is paired Frequency Division Duplex (FDD)

² <https://main.traai.gov.in/sites/default/files/RecommendationsAuctionofSpectrum01082018.pdf>

³ https://main.traai.gov.in/sites/default/files/RecommendationsPPDR04062018_0.pdf

spectrum of 2x10 MHz i.e. 814-824 MHz (UL) and 859-869 MHz (DL) can be harmonized to meet the Indian Railways spectrum requirement for RSTT. The provisioning of RSTT features/services based on LTE-R and PPDR features/services based on PS-LTE has great degree of commonality (for quick review please refer to the Informative Annex at the end). Also deploying communication networks based on LTE technology on harmonized spectrum for both RSTT and PPDR allows easy co-ordination and interworking between the two networks during disaster situation, which is essential and best practice worldwide. This approach of harmonizing the Band 26 spectrum for PPDR and Indian Railways is in the national interest to judiciously utilize scarce national assets.

Q.4 In case it is decided that spectrum in IMT bands which have already been earmarked for mobile services, be assigned to Indian Railways for RSTT in India, what should be the methodology (including price) of allotment of spectrum?

We do not provide specific comments, however, please refer to our response to Q.5.

Q.5 In case it is decided to assign spectrum in other spectrum bands (including 450-470 MHz band), what should be the methodology (including price) of allotment of spectrum?

Spectrum with 2x10 MHz block in Band 26 having similar radio propagation characteristics as 700 MHz band is recommended by the Authority on no-cost basis for PPDR, the same approach should be extended to Indian Railways while harmonizing the spectrum requirement for PPDR and RSTT.

Q.6 Do you foresee any challenges, if IR makes internet services available onboard i.e. within the train using spectrum allocated for signaling purpose?

The main spectrum requirement for Indian Railways is RSTT i.e. signaling purpose. This requirement concerning railway safety and passenger safety shall not be compromised for providing complementary internet services onboard. If the objectives of Connect India mission spelt out in NDCP 2018 are fulfilled by TSPs, there will be no need by Indian Railways to duplicate the efforts for providing internet services onboard. Regardless of that, onboard internet services shall be made available using unlicensed spectrum using WiFi technology as access and spectrum assigned to Indian Railways as backhaul. For backhaul carrying internet traffic, additional spectrum may be required other than the RSTT requirement of 2x10 MHz which will be needed for signaling purpose.

Q.7 Whether the requirement of IR for RSTT can be fulfilled using the following alternate methods: i) Alternate method suggested in para 4.47, wherein a TSP could build, deploy and maintain LTE-R network for IR; while the control, use and operation of the LTE-R network may be with IR.

OR

ii) Alternate method suggested in para 4.48, wherein there could be a common integrated network (with common spectrum) for Public Safety i.e. Public Protection and Disaster Relief (PPDR) and Railways, using PS-LTE and LTE-R technology respectively.

We share the view of the Authority that the alternate method suggested in para 4.48 i.e. common



integrated network for RSTT and PPDR on harmonized PPDR spectrum i.e. Band 26 based on LTE-R and PS-LTE is a good option to consider. The radio resource allocation for RSTT should not overlap with the radio resource allocation for PPDR to avoid interference problems. To optimize interference, the concerned ministries i.e. Indian Railways, Department of Telecom & PPDR SPV under MHA shall establish Standard Operating Procedure (SOP). Such network topology deployment is technically feasible through proper network planning. This approach avoids the interference from PPDR network to the RSTT network but at the same time PPDR agencies first responders can roam in the RSTT network in case of emergency scenarios like accidents to coordinate and handle the relief operations. The build out of such common network topology for both RSTT and PPDR should be through appropriate tendering procedure. The operational control of the RSTT network and PPDR network rests with Indian Railways and PPDR SPV under MHA respectively through a dedicated core or dedicated slice of the common core. The maintenance of the network can be taken care by a third party.

Samsung reiterates that deploying common communication network using LTE technology on harmonized spectrum for both RSTT and PPDR as suggested above is best strategy in national interest of all stakeholders. This allows easy co-ordination, optimal spectrum usage, smooth scaling up and interworking between the two networks during disaster situation.

OR

iii) Any other method as may be suggested by the stakeholders. (Please provide detailed response with justifications and required enabling provisions.)

We do not provide specific comments, however, please refer to our response to (ii).

Q.8 If there are any other issues/suggestions relevant to the subject, stakeholders may submit the same with proper explanation and justification.

We do not provide specific comments, however, please refer to Informative Annex.

Informative Annex - RSTT and PPDR Harmonization

LTE is emerging as global standard for Train control and Railway Signalling applications replacing GSM-R technology. LTE-based communication requirements by Railways is to cater data and voice needs for Train-Control, Train-Stations and Train-Train communication for improved train operations, passenger safety and passenger security services and remote rail asset monitoring and management. Some of the key functional requirements of Railway communication (a.k.a. RSTT) belong to the following broad category: Voice Call Service, Data Service, Video Call Service, Call Function, Railway Service.

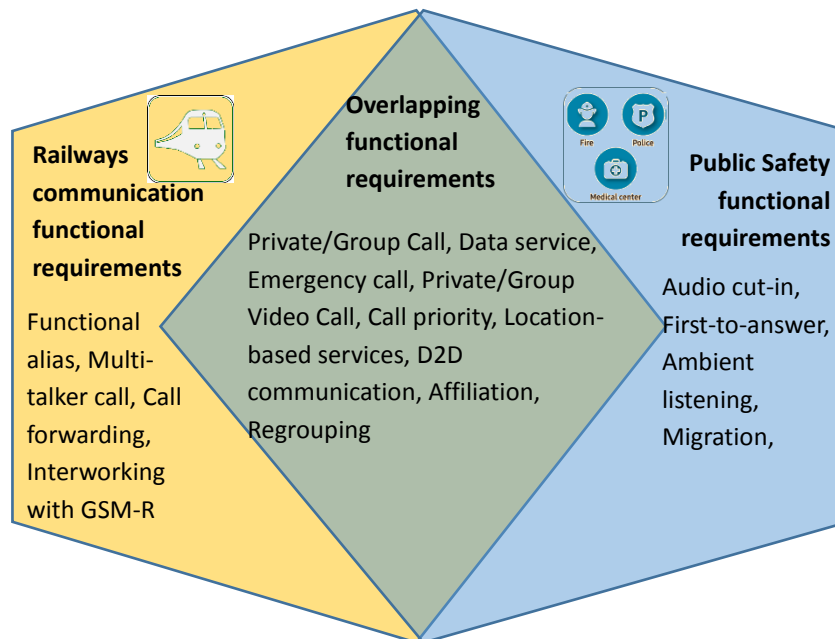


Figure 1: Function Requirements comparison between Railways and Public Safety

Above Figure 1 shows that there are many features that are similar between Railways and the PPDR institutions. 3GPP has specified standard specifications for Railway Communication requirements together in the same standards specification for the PDDR requirements, effectively justifying the need to harmonize and reuse of the standard specifications between the two institutions. Also deploying Railway communication and BB-PPDR using different communication networks makes it difficult for them to share disaster situation information.

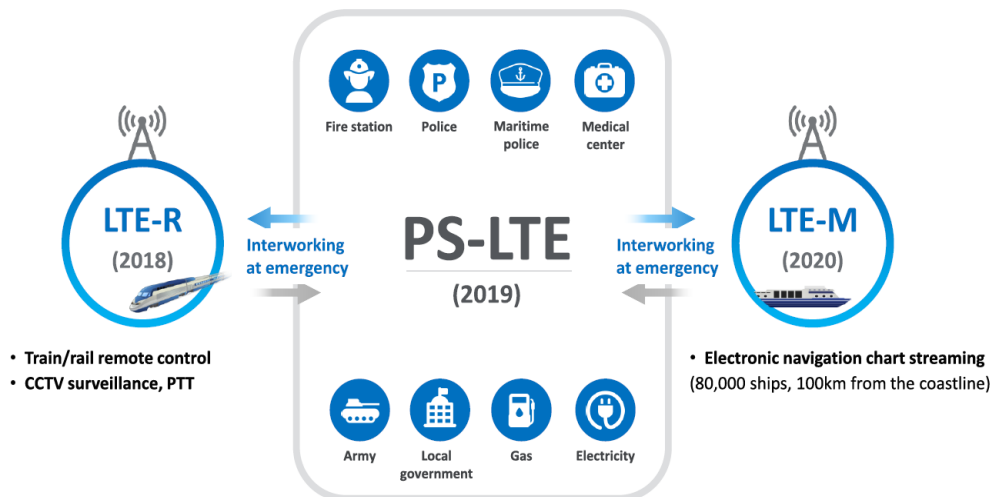


Figure 2: LTE Mission Critical Network Project in Korea

In the Republic of Korea, the national disaster safety network project is being built using Long Term Evolution (LTE) for public safety (PS). Frequency band for next-generation railway network and e-navigation network over marine environment are also harmonized to the same frequency band as the public safety network. This allowed the deployments of PS-LTE to work together with LTE-Railway (LTE-R) and LTE-Marine (LTE-M), for railway and maritime wireless communication networks, respectively (see Figure 2). This is expected to enable institutions to promptly share information at disaster sites and send high quality wireless images to one another. They are planning to eliminate multiple management points and establish a unified disaster management and rescue system.

3. Acronyms and Abbreviation

3GPP	3rd Generation Partnership Project
DL	Downlink
E2E	End to End
FDD	Frequency Division Duplex
LSA	Licensed Service Areas
LTE	Long-term evolution
LTE-R	LTE for Railways
MHA	Ministry of Home Affairs
NDCP	National Digital Communication Policy
PLMN	Public land mobile network
PPDR	Public Protection and Disaster Relief

PS-LTE	LTE for Public Safety
RAN	Radio Access Network
RSTT	Railway Radiocommunication Systems between Train and Trackside
SOP	Standard Operating Procedure
SPV	Special Purpose Vehicle
TRAI	Telecom Regulatory Authority of India
TSP	Telecom Service Provider
UL	Uplink

4. Contacts

Samsung R&D Institute India - Bangalore

Suresh CHITTURI (s.chitturi@samsung.com)

Samsung R&D Institute India - Bangalore

Mangesh Abhimanyu INGALE (m.ingale@samsung.com)

Samsung R&D Institute India - Bangalore

Basavaraj PATTAN (basavarajp@samsung.com)