

# **Proposal for Spectrum for PPDR towards NFAP 2016**

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## **Executive Summary**

This document presents the status of the existing public safety communication systems in the country, discusses the global evolution of public safety communications and lays down recommendations for similar advancements in India to address the India specific needs. The document also provides the status of frequency allocation for public safety/mission critical communication services in India, discusses the global developments in tandem with the evolution of spectrum needs for mission critical communication and proposes an appropriate frequency allocation to address contemporary public safety requirements in the Indian scenario.

### **1. Background**

In the last couple of decades, there has been a drastic rise in internal as well as external security threats to our country including urban terrorism. Additionally, the impact and the frequency of natural as well as man-made disasters have also increased. The recent floods in Chennai and the 26/11 Mumbai terrorist attacks have highlighted an urgent need for the technology upgrade of the currently deployed emergency communication systems and concurrent policy changes for such advanced systems.

Situational awareness is the need of the hour for our national security and public safety agencies to provide a fast and effective response during any national emergency. Remote video surveillance, real-time video communication and rapid exchange of data such as building plans, maps and other contextual information from incident sites to control centres, would help immensely in providing an effective response to emergencies.

However at present, only Narrowband Public Protection and Disaster Recovery (PPDR) communication systems are deployed in the country. Such systems typically operate on spot frequencies to support only two-way voice communications (at best short data transfer), with little or no inherent support for multimedia services. These technologies, are not capable of supporting transfer of high speed data, which is required for an effective public safety and disaster recovery operation. Also, the existing Indian security infrastructure based on such systems is not capable of highly secure communication, thereby allowing easy access to critical information by rogue entities.

Third Generation Partnership Project's (3GPP's) Long Term Evolution (LTE)-Advanced technology is emerging as the de-facto world-wide standard for mission critical wireless broadband communication system. Commonly deployed narrowband PPDR standards such as Terrestrial Trunk Radio (TETRA) and Project 25 (P25) are also moving towards a mobile broadband technology solution. "TETRA and Critical Communications Association" (TCCA) has recently forged a partnership with 3GPP and are working together towards the development of a common wireless broadband communication system based on LTE [1]. Therefore, it is imperative for India also to upgrade its PPDR infrastructure by leveraging

state of the art wireless broadband communication system to support high speed data transfer and to ensure secure communication between Indian security agencies.

In order to deploy wireless broadband communication system for mission critical communication and to pave the way for the enhancement of the public safety communication ecosystem in India, there is an indispensable need for the allocation of dedicated spectrum for broadband services in the public safety bands.

## **2. Spectrum Allocation for Broadband PPDR (BB-PPDR) Worldwide**

Facing similar challenges as above, many countries have started working towards the deployment of BB-PPDR systems and have allocated dedicated spectrum for these systems. The Federal Communications Commission (FCC) in the United States (US) has designated “758-769/788-799 MHz” as a broadband public safety communication spectrum and this band is licensed to the First Responder Network Authority (First Net) for building and operating a nationwide broadband public safety network in the US [2].

Similarly in countries like Canada and South Korea, the government has allocated 2x10 MHz of 700 MHz spectrum for a public-safety broadband network [3][4]. Many countries in Europe, e.g. France, have also started allocating dedicated spectrum for BB-PPDR.

### **2.1 International Telecommunication Union-Radio communication (ITU-R)**

In its Resolution 646 of World Radiocommunications Conference (WRC)-15, ITU-R has recognized that bands 406.1-430 MHz, 440-470 MHz and 4940-4990 MHz could be used for PPDR applications including Broadband PPDR in Region 3 (where India belongs) [5].

## **3. Spectrum Allocation for Broadband PPDR in India**

### **3.1 Need for review of current allocation**

The current frequency allocation for public safety communication in India is as per IND82 of the National Frequency Allocation Table (NFAP-2011) [6], which is as follows:

*IND82: Requirement of public protection and disaster relief (PPDR) communications including Broadband Wireless Access may be considered, as far as possible, in the frequency bands 380-400 MHz, 406.1-430 MHz, 440-470 MHz, 746-806 MHz, 806-824/851-869 MHz, 4940-4990 MHz and 5850-5925 MHz on a case by case basis depending on specific need and equipments availability.*

The following are a few observations on the above allocation which point towards the need for revisiting the same.

- With multiple bands designated for PPDR currently, there is no uniformity in the operational frequency bands for Narrowband PPDR across the nation. Various state and central security agencies are adopting different non-interoperable technologies

such as Project 25 (P25), Terrestrial Trunk Radio (TETRA) or Digital Mobile Radio (DMR) [7] [8] [9]. These are restricted to operate only in the frequency bands for which the devices are supported by the vendors. This prohibits the use of a homogeneous infrastructure and devices by different agencies of the country, which is very critical when there is a need for various security agencies to share vital information with each other especially during the moments of grave crises.

- No dedicated frequency band has been allocated for broadband PPDR, which apparently is the need of the hour. It is therefore important for India to assign bands for exclusive deployment of BB-PPDR systems as being done by many other countries (USA, Korea, Canada, France etc.).

### 3.2 Recommendations

- Designate the band 440-470 MHz<sup>1</sup> as the nationally harmonized spectrum dedicated for BB-PPDR operations. This band would be an ideal candidate for BB-PPDR in India considering the following factors.
  - This would help in alignment of NFAP with the recommendations of Resolution 646 of WRC (Geneva, 2015) [5].
  - In terms of path loss in outdoor environments, 400 MHz fares better than other higher frequency bands, say 700/800 MHz, recommended as part of IND82 in NFAP-2011. Building penetration in urban areas, including indoor coverage in difficult places such as stairwells, is also good for 400MHz.
  - The propagation characteristics of 400 MHz band are typically better than those of 700/800 MHz band. Therefore the communication network using 400 MHz band is likely to have lesser number of base stations than the one using 700/800 MHz band, which is expected to result in the reduction of capital expenditure (CAPEX) and Operational and Maintenance cost (OPEX). This also means that with the introduction of broadband services in the 400 MHz band, coverage of a given area can be achieved with the same number of radio sites as the current narrow band networks deployed in the same band.
  - Telecom Regulatory Authority of India (TRAI) has recommended the adoption of the Asia Pacific Telecommunity (APT) 700 band plan [10] [11]. In the 700 MHz band (698-806MHz), 2x35 MHz is to be assigned for commercial use and 2x10 MHz is to be reserved for Defence as per these recommendations, making it difficult for the band to be allocated for BB-PPDR.
- Considering the large population in big cities in India, a contiguous frequency band of at least 20MHz should be allocated for BB-PPDR so that it could cater to the requirement of public safety related communication. Other nations like the US, Canada and South Korea have also allocated 20MHz of bandwidth for BB-PPDR [2].

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<sup>1</sup> 406.1-410MHz has also been designated for radio astronomy services on a primary basis and 410-430MHz, 806-824/851-869MHz may not be able to support 20 MHz bandwidth for TDD based system for BB-PPDR operations.

- Time Division Duplex (TDD) scheme would be a better fit for Public safety communication, as it may support configurations to allow different uplink and downlink data rates to cater to different service requirements.

### 3.3 Proposal for revision of IND82 of NFAP 2011

Currently, no specific band has been identified for dedicated narrow band PPDR operations in India. These radios are operated on spot frequencies that are assigned to different public safety entities on a case-by-case basis. Considering that existing narrow band systems (TETRA/P25 /DMR) are currently deployed in 400MHz/800MHz and to meet the operational needs outlined in the **Recommendations** section of this document, it is proposed to modify remark **IND82** for BB-PPDR as follows:

*IND82: Requirement of **narrowband** public protection and disaster relief (PPDR) communications ~~including Broadband Wireless Access~~ may be considered, as far as possible, in the frequency bands 380-400 MHz, 406.1-430 MHz, ~~440-470 MHz<sup>2</sup>, 746-806 MHz<sup>3</sup>~~, 806-824/851-869 MHz, 4940-4990 MHz ~~and 5850-5925 MHz<sup>3</sup>~~ on a case by case basis depending on specific need and equipments availability. Requirement of broadband public protection and disaster relief (PPDR) communications may be considered, as far as possible, in the frequency band 440-470 MHz as Time Division Duplex (TDD) Band Plan subject to coordination on a case by case basis.*

**The updated IND82 is therefore suggested as-**

*IND82: Requirement of narrowband public protection and disaster relief (PPDR) communications may be considered, as far as possible, in the frequency bands 380-400 MHz, 406.1-430 MHz, 806-824/851-869 MHz, 4940-4990 MHz on a case by case basis depending on specific need and equipments availability. Requirement of broadband public protection and disaster relief (PPDR) communications may be considered, as far as possible, in the frequency band 440-470 MHz as Time Division Duplex(TDD) Band Plan subject to coordination on a case by case basis.*

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<sup>2</sup> 440-470 MHz is being proposed as a dedicated band for BB-PPDR.

<sup>3</sup> This is consistent with the recommendations in Resolution 646 of WRC-15 for Region 3[5].

#### 4. References

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- [2] <https://www.fcc.gov/public-safety/public-safety-and-homeland-security/policy-and-licensing-division/public-safety-spectrum#block-menu-block-4>
- [3] <http://urgentcomm.com/public-safety-broadbandfirstnet/south-korea-uk-aim-completion-public-safety-lte-deployments-next-yea?page=2>
- [4] <http://www.rrmediagroup.com/News/NewsDetails/NewsID/11430>
- [5] Resolution 646, World Radio Communication Conference (WRC-15), Geneva, Switzerland.
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- [7] [www.delhipolice.nic.in/writereaddata/tender%20doc%20final.doc](http://www.delhipolice.nic.in/writereaddata/tender%20doc%20final.doc)
- [8] <http://keralapolice.org/telecommunication/telehistory.html>
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