



TRANSNET APPLICATION TO AMEND A RADIO FREQUENCY SPECTRUM LICENCE No 2515425

Circulation Restricted To:

Transnet Freight Rail
ICASA

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TABLE OF CONTENTS

| | |
|---|-----------|
| I. ABBREVIATIONS, ACRONYMS AND DEFINITIONS | II |
| 1. INTRODUCTION | 1 |
| 2. TRANSNET CURRENT FREQUENCY ALLOCATION | 1 |
| 3. REASONS FOR AMENDMENT | 2 |
| 3.1. Government Gazette 38640 notice 270 of 30 March 2015 | 2 |
| 3.2. Technology obsolete | 2 |
| 3.3. Technology evolution | 2 |

I. ABBREVIATIONS, ACRONYMS AND DEFINITIONS

| ABBREVIATIONS AND ACRONYMS | DESCRIPTION |
|-----------------------------------|---|
| 3GPP | 3rd Generation Partnership Project |
| DMR | Digital Mobile Radio |
| dPMR | Digital Private Mobile Radio |
| EIRENE | European integrated railway radio enhanced network |
| ICASA | Independent Communication Regulator of South Africa |
| ICASA | Independent communication Authority of South Africa |
| IMT | International Mobile Telecommunications |
| LTE | Long Term Evolution |
| MHz | Megahertz |
| MPT | Ministry of Posts and Telegraph |
| Ms | milliseconds |
| OEM | Original Equipment Manufacturer |
| TEDS | TETRA Enhanced Data Service |
| TETRA | Terrestrial Trunk Radio |
| TFR | Transnet Freight Rail |



1. INTRODUCTION

Transnet Freight Rail (TFR) currently operates a mission critical radio network to communicate with train operations, shunting and maintenance operations safely. This is accomplished using two narrow band analogue networks termed the conventional and trunked radio networks. The type of users for this networks includes railway freight & passenger and port operations. Transnet also leases services from a commercial operator on the line from Ogies to Richards bay.

In March 2015 the Independent Communication Authority South Africa ICASA issued a Radio Frequency Spectrum Assignment Plan (RFSAP) in which the spectrum in the 450-470 MHz band would be assigned for IMT technologies. Transnet is one of the current users in this band and as such a decision has been made that an IMT technology must be implemented in this band for Transnet operations. The aim of the report is to highlight the reasons for the amendment of the frequency currently in use.

2. TRANSNET CURRENT FREQUENCY ALLOCATION

Currently Transnet makes use of the 450-470 MHz band to ensure voice communication coverage for train operations. The allocation consist of a total of 133 narrow band channels that provide coverage as well as X channels to provide UHF links. The diagram below highlights the frequency usage as currently deployed.

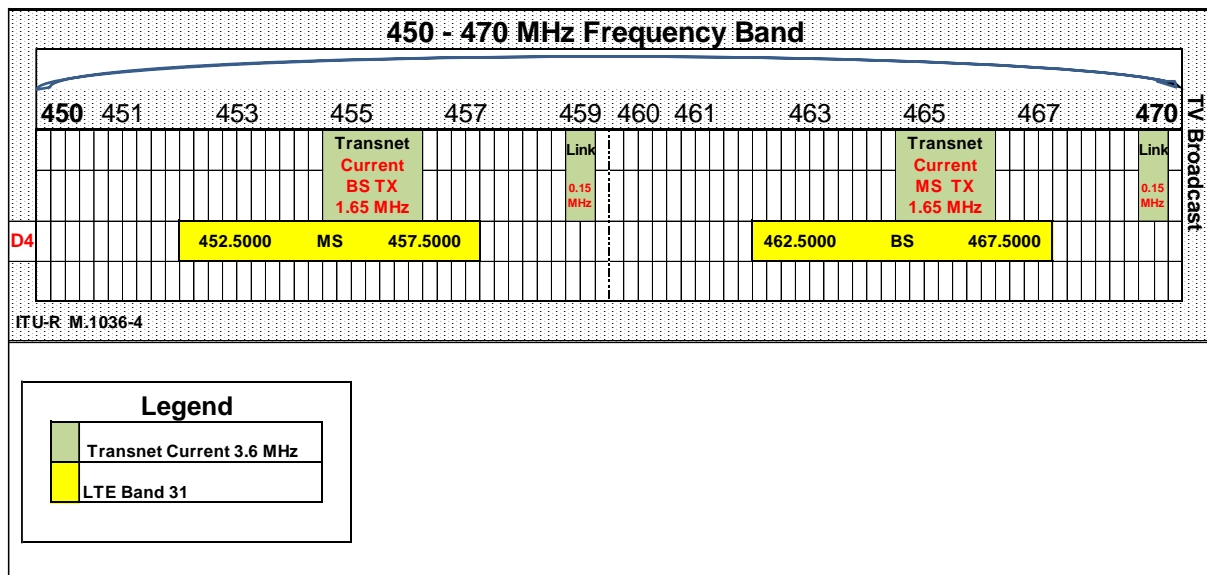


Figure 1: Transnet Channel plan with respect to IMT spectrum in the 450 MHz



3. REASONS FOR AMENDMENT

The networks that Transnet has deployed to date have been based mainly in the provision of voice communication. The following sections highlight some of the challenges that Transnet has to address for operational requirements

3.1. Government Gazette 38640

The 450-470MHz band was listed within the final frequency spectrum assignment plan (GG 38640 notice 270) as one of the bands that must be vacated for the usage of IMT. As an incumbent of the band Transnet has deployed sites that are distributed in line with the coverage offered by the frequency band. One of the requirements for a new assignment as noted in the gazette is that “only systems using digital technologies that promote spectral efficiency will be issued with an assignment. For Transnet to comply with this requirement the usage of the band using analogue must be discontinued and the frequency spectrum usage amended

3.2. Technology obsolete

The analogue technology has reached the end of life with limited OEM support. In the past 4 Years Transnet has received multiple notifications from OEM indicating the discontinuing of analogue peripheral products that are needed for mission critical communication. The manufactures of network equipment have also moved on to digital networks. Thus Transnet must amend the licence in order to deal with the lifecycle of the technology and ensure a safe and reliable transport system.

3.3. Technology evolution

Ever since the inception of Railway telecommunication there has always been standards that have supported mission critical telecommunication. The figure below highlights some of the standards that have been implemented as well as those that support Railway telecommunication.

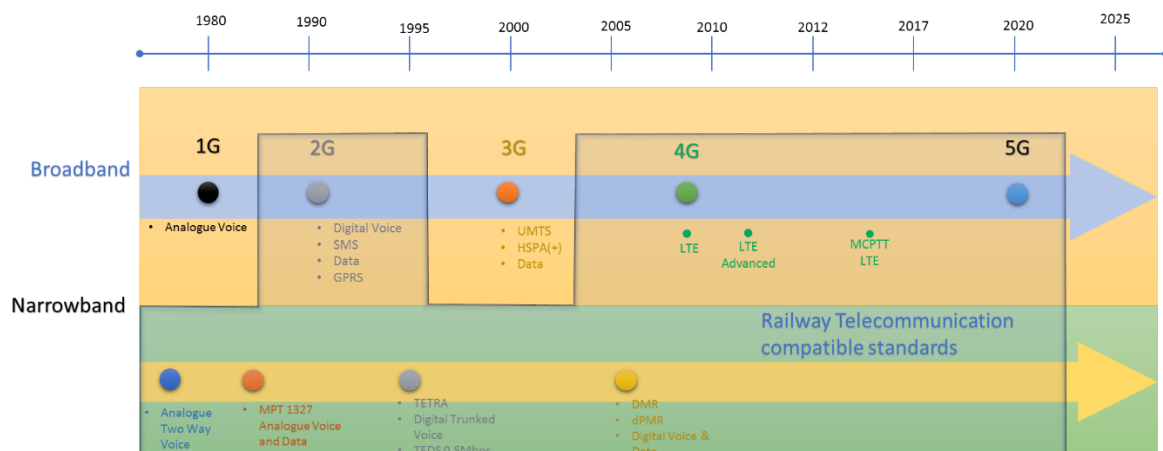


Figure 2: Railway Telecommunication Standards



The narrowband telecommunication standards have evolved from analogue systems that catered for voice to new digital standards that support voice and data. The broadband standards have also evolved from 1G until 5G. The narrowband technologies however do not evolve from one to the next generation. Once an operator has to move from one standard to the next they must completely change the entire system. This is often costly and carries risk to the operator. The broadband standards however evolve from one to the next generation. The standards have also now focused on the implementation of mission critical push to talk. Transnet would like to benefit from the evolution of standards provided by broadband and as such the licence must be amended in order to implement such a technology.

4. TRANSNET AMENDMENT

In accordance with the ITU recommendations from the government gazette 38640 Transnet would like to apply for an amendment of the current licence to option D4 (452.5-457.475MHz paired with 462.5-467.475 MHz) as highlighted in the diagram below.

| Frequency arrangements | Paired arrangements | | | | Unpaired arrangements (e.g. for TDD) (MHz) |
|------------------------|----------------------------------|------------------|--------------------------------|-------------------------|--|
| | Mobile station transmitter (MHz) | Centre gap (MHz) | Base station transmitter (MHz) | Duplex separation (MHz) | |
| D1 | 450.000-454.800 | 5.2 | 460.000-464.800 | 10 | None |
| D2 | 451.325-455.725 | 5.6 | 461.325-465.725 | 10 | None |
| D3 | 452.000-456.475 | 5.525 | 462.000-466.475 | 10 | None |
| D4 | 452.500-457.475 | 5.025 | 462.500-467.475 | 10 | None |
| D5 | 453.000-457.500 | 5.5 | 463.000-467.500 | 10 | None |
| D6 | 455.250-459.975 | 5.275 | 465.250-469.975 | 10 | None |
| D7 | 450.000-457.500 | 5.0 | 462.500-470.000 | 12.5 | None |
| D8 | | | | | 450-470 TDD |
| D9 | 450.000-455.000 | 10.0 | 465.000-470.000 | 15 | 457.500-462.500 TDD |
| D10 | 451.000-458.000 | 3.0 | 461.000-468.000 | 10 | None |

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