International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

TETRA MOBILE TRAIN RADIO COMMUNICATION

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ABSTRACT

During the last few years autonomous underwater vehicle (AUV) technology has evolved from concept demonstrators towards commercial products. The driving forces are the move for energy exploitation towards deeper waters, naval applications and the Internet driven need for more intercontinental underwater communication cables. In this scenario, there is an increasing understanding that underwater robotics and in particular AUVs will play an important role in future survey and subsea engineering work. The AUV as a free-swimming underwater survey sensor carrier has several advantages compared to cable controlled ROV's and deep towed systems.

1. INTRODUCTION

Since its inception in 1853, Indian Railways have progressed a long way. Presently, India has the third largest railway network in the world, covering a total length of around 65,000 Kilometers. With the passage of time, Railways have become a commonly used medium for long distance transport in India. More and more passengers are using Railways as a means of travel. Millions of tones of goods are now being transported by trains. Indian Railways transport 7651 billion passengers and over 921 million tones of goods annually. As the world is getting technologically advanced, more complications have set in regarding safety and security of passengers. The report of the High Level Safety Review Committee of 2012 estimates that almost 15,000 number of persons gets killed every year in train accidents. Apart from this, security in trains is also a major concern. Considering all these necessities, the need of the hour is to develop an effective and a technologically advanced communication system in the Indian Railways[25].

2. METHODOLOGY

The Mobile Train Radio Communication (MTRC) system seems to be the right answer to theseconcerns. MTRC uses the "Global System for Mobile Communications-Railway (GSM-R)" technology to facilitate an instant and constant interaction with the train crew with the Control Centre and Station Master. It ensures safety of passengers by providing effective communication between Driver and Control Room. The MTRC system can be used to warn the drivers beforehand of the running trains as well as the concerned officials. In case of any security problem,concerned staff can immediately intimate the concerned security establishment. If any accident takes place, the MTRC system will facilitate better post-disaster management. In the present day, Railways need not just effective voice transmission, but also have the capability to analyze all the technical data to arrive at the correct decision to be taken on the spot.

3. BLOCK DIAGRAM

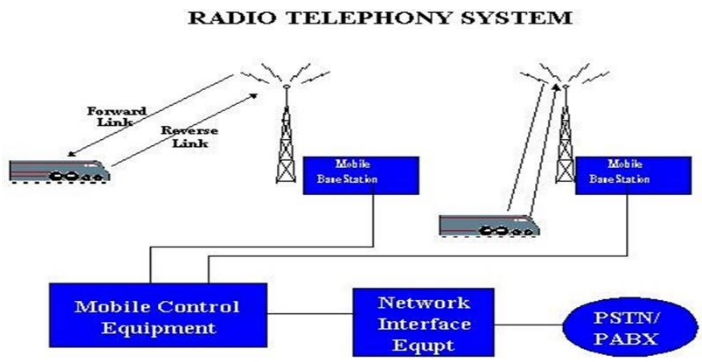


Fig 1 Block Diagram

Figure.1Shows the Block diagram Each mobile uses a separate, temporary radio channel to talk to the cell site. The cell site talks to many mobiles at once, using one channel per mobile. Channels use a pair of frequencies for communication. One for transmitting from the cell site, the forward link, and one frequency for the cell site to receive calls from the users, the reverse link. Communication between mobile units can be either half-duplex or full-duplex. In case of half-duplex, transmit and receive communications between the mobile units are not at the same time. talking and listening can not be done at the same time. In case of full-duplex communication, transmit and receive communication is at the same time, i.e. one can talk and listen at the same time. When communications between mobile units are within a cell, and if the same is half-duplex, then it shall require only one pair of frequency. If the same is fullduplex, then requirement of frequency pair shall be two. When a mobile unit is communicating with a mobile unit outside the cell, then the requirement of frequency pair shall be one per cell for both half-duplex and full-duplex communication. Hence the system resources are utilized more if the mobile units communicate with each other in full-duplex mode.

4. DEVELOPMENTS OF LTE FOR RAILWAYS- FRMCS

In 1994, ETSI GSM standard was selected by UIC as the bearer for first Digital Railway Radio Communication System. Needs of railways were captured in dedicated specifications named EIRENE, including both functional and system aspects. These specifications were reinforced as GSM-R within ETSI/3GPP international standards.

The first operational implementation of GSM-R targeting the setup of this new technology was launched in 1999, and the first countrywide GSM-R operation started in 2004. In parallel, the EU Directives officially adopted the GSM-R as the basis for mobile communication between train and track for voice (train radio) and control-command and signaling data (ETCS), with the aim to form a worldwide standard, the European Rail Traffic Management System, the now well- known ERTMS.

5. PILOT PROJECTS OF LTE FOR RAILWAYS

In China, the development of LTE for Railway also has been widely discussed and scheduled by the government. The first LTE for Railway network of China is scheduled for 2020. In Europe trials are underway to provide 5G services to intercity trains.

LTE FOR RAILWAY SERVICES

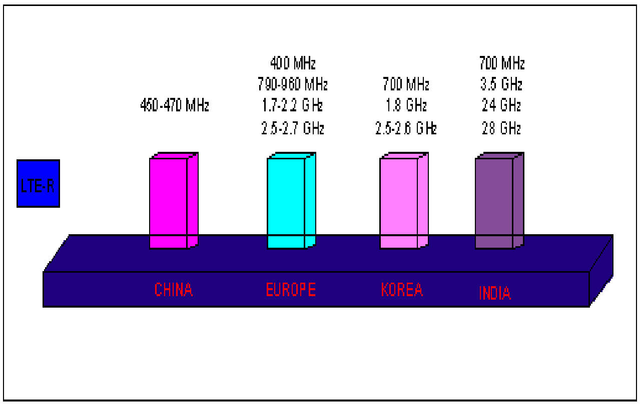
As suggested by the E-Train project, LTE for Railway will provide a series of services to improve security, QoS, and efficiency. As compared with the traditional Train Control & Safety Enhancement features of GSM-R, some special features of LTE for Railway recommended to be are

- Information transmission of control systems
- Real-time monitoring
- Train multimedia dispatching
- Railway emergency communications
- Railway Internet of Things (IoT) [36].

6. LTE FOR RAILWAYS SPECTRUM

Spectrum usage for LTE-R is an important strategic infrastructure issue. There is a general demand from manufacturers and service providers in different countries, that large spectrum chunks need to be allocated specifically for it. Some industry bodies, including the European Railway Agency (ERA), China Railway, and UIC, are working to secure spectrum allocation for High Speed Railway use.

Currently, most LTE systems work at the bands above 1 GHz, such as 1.8, 2.1, 2.3, and 2.6 GHz, although 700–900- MHz bands are also used in some countries. Bandwidth is generally available in the upper bands, giving a higher data rate, whereas lower frequency bands offer longer distance coverage. The frequency bandwidths presently under consideration for LTE -R in China, Europe, and Korea [8].



By 2019 Commercial services in 5G are expected to be rolled out in USA (in 28 , 37 ,30 GHz band) , UK (in 3400 MHz band), Europe (in 3400-3800 MHz band), China (in 3300-3600 & 4800-5000 MHz band) , South Korea (in 3500MHz & 28 GHz band) and Japan (in 3700 MHz, 4500 MHz

, 28 GHz, & 70 GHz band) Verizon, T-Mobile & Sprint in USA , China Mobile & China Unicom in China , S K Telecom & Korea Telecom in South Korea , Telstar in Australia and Vodafone in UK , are undertaking field trials of 5 G to introduce commercial services

Vehicles were the primary mode of transportation for most of us and we depend on them for our daily commute. Unfortunately, many mistakes can happen in Driving, and such as brake failure is one. In this system, the brake pedal is connected to the brake system with metal.

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