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| **Radiocommunication Study Groups** |  |
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| Source: Document 5A/TEMP/120 | **Annex 14 to Document 5A/359-E** |
| **11 May 2021** |
| **English only** |
| Annex 14 to Working Party 5A Chairman’s Report | |
| Working document towards a preliminary draft revision of Report ITU-R M.2442-0 | |
| Current and future usage of railway radiocommunication systems  between train and trackside | |

Summary of the revision

This revision includes additional information of currently used RSTT in Ukraine and their future development. Information on country specific frequency bands used for Railway Radiocommunications Systems for Train and Trackside are also provided in new Annex 9.

# 1 Scope

[Editor’s note: There are no changes in this section.]

# 2 Background

[Editor’s note: There are no changes in this section.]

# 3 Related documents

[Editor’s note: There are no changes in this section.]

# 4 List of acronyms and abbreviations

[Editor’s note: There are no changes in this section.]

# 5 Examples of current technologies for RSTT

[Editor’s note: There are no changes in this section.]

# 6 Technical and operational characteristics of currently used RSTT

This section presents the technical and operational parameters/characteristics of current RSTT systems provided by Administrations. For further details of each technology, see Report ITU-R M.2418. According to the categorization of four main applications of RSTT, those systems are also categorized to each application accordingly. In this section, technical and operational characteristics of currently used RSTT are provided based on information provided by the following administrations and regional organization:

– 39 Administrations: Angola (AGL), Armenia (ARM), Australia (AUS), Bosnia and Herzegovina (BIH), Botswana (BOT), Canada (CAN), China (CHN), Czech Republic (CZE), Finland (FIN), France (F), Germany (D), Hungary (HNG), Iraq (IRQ), Italy (I), Japan (J), Republic of Korea (KOR), Malawi (MWI), Malta (MLT), Mexico (MEX), Mozambique (MOZ), Namibia (NMB), Netherlands (HOL), Norway (NOR), Qatar (QAT), Russian Federation (RUS), South Africa (AFS), Spain (E), Eswatini (SWZ),Sweden (S), Switzerland (SUI), Tanzania (TZA), Thailand (THA), Ukraine (UKR),United Arab Emirates (UAE), United Kingdom (G), United States (USA), Uzbekistan (UZB), Viet Nam (VTN), Zambia (ZMB).

– 1 Regional Organization: CEPT.

## 6.1 Radiocommunication systems used for train radio

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TABLE 6.1.1 (*continued*)

| # | | 43 | … | 49 | 50 | 51 |
| --- | --- | --- | --- | --- | --- | --- |
| Use by which Administration(s) | | AUS |  | MEX | UKR | UKR |
| Specific name (if have) | | Conventional Train Radio  Wayside radio  Auto Train Protection |  | Yard operations | Analogue radiocommunication, MF range | Analogue radiocommunication, VHF range |
| Frequency range (MHz) | | 406-430 |  | 160.200-173.600 | 2.130; 2.150 | 151.725-154.000;  155.000-156.000 |
| Radiocommunication Standards | |  |  | AAR standards |  | National standard DSTU 4184:2003 |
| Channel separation (kHz) | | 6.25, 12.5, 25 |  | 12.5 | 0 | 12.5 |
| Antenna gain (dBi) | | BS: +various  (typ 2.2, 5.2, 8.2, 11.2)  MS: +various  (typ 2.2, 5.2) |  | 7.4 | 0 | 0 - 17 |
| Polarization | | Vertical |  | Vertical | vertical / horizontal | vertical |
| Transmitting radiation power (dBm) | | BS (typ): +40 to 47  Mob/: +30 to 44  Port (typ): +30 to 3741 |  | 44.77 | 36.99-43.01 | 36.99-43.98 |
| e.i.r.p. (dBm) | | BS: up to 49.2  Mob: up to 46.1  Port: up to 39.2 |  |  |  |  |
| Receiving noise figure (dB)  Fixed station/mobile/portable | | BS (typ): 12  Mob/Port (typ): 14 |  |  |  |  |
| Transmission data rate (kb/s) | | 9.6 |  | Voice | - | - |
| Transmission distance (km) | | 5-40 |  | Varies | max 15 | max 30 |
| Modulation | | FM/FSK |  | FM | FM | FM |
| Multiplexing method | | FDD |  | None | FDMA | FDMA |
| Reception quality | | > 12 dB SINAD Variable |  |  |  |  |
| Applications | Voice/Dispatch | X |  | X | X | X |
| Maintenance | X |  | X | X | X |
| Train Control | X |  | X | X | X |
| Emergency | X |  | X | X | X |
| Train information |  |  |  |  |  |
| Scenarios | Railway line | X |  | X | X | X |
| Railway station | X |  | X | X | X |
| Shunting yard | X |  | X | X | X |
| Maintenance Base | X |  | X | X | X |

## 6.2 Radiocommunication systems used for Train positioning information

[Editor’s note: There are no changes in this section.]

## 6.3 Radiocommunication systems used for Train remote systems

[Editor’s note: There are no changes in this section.]

## 6.4 Radiocommunication systems used for Train surveillance

[Editor’s note: There are no changes in this section.]

## 6.5 Summary



# 7 Considerations on evolving technologies for RSTT including technical and operational characteristics of future RSTT

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TABLE 7-1

Considerations of some Administrations on the evolving technologies for RSTT

| Countries | Answers |
| --- | --- |
| Australia | Train control radio and maintenance radio in South east Queensland currently migrating to Tier 3 DMR. |
| … |  |
| Ukraine | JSC “Ukrzaliznytsya” plans to modernize the technological radiocommunication network of railway transport of Ukraine through the introduction of the digital radiocommunication system of the DMR standard. Also, in the case of the construction of high-speed railway lines in Ukraine, it is considered the possibility of introduction of RSTT based on GSM-R and LTE-R (FRMCS)standard radio interface |

# 8 Current Spectrum Usage of RSTT

The following Figures show the current spectrum usage of RSTT.

## 8.1 Current spectrum usage of Radiocommunication systems used for Train radio

### 8.1.1 Overview

FIGURE 1

Overview of spectrum usage of Radiocommunication systems used for Train radio



### 8.1.2 Segment views

FIGURE 2

0-3 MHz



FIGURE 3

3 MHz – 30 MHz



FIGURE 4

30 MHz – 300 MHz



FIGURE 5

300 MHz – 3 GHz



FIGURE 6

3 GHz – 30 GHz



FIGURE 7

30 GHz – 100 GHz



[Editor’s note: There are no changes in the rest parts of Section 8.]

# 9 Differing deployment and operations approaches

[Editor’s note: There are no changes in this section.]

# 10 Summary of the study

[Editor’s note: There are no changes in this section.]

Annex 1  
  
RSTT in Japan

[Editor’s note: There are no changes in Annex 1.]

Annex 2  
  
RSTT in China

[Editor’s note: There are no changes in Annex 2.]

Annex 3  
  
RSTT in Russia

[Editor’s note: There are no changes in Annex 3.]

Annex 4  
  
RSTT in Korea

[Editor’s note: There are no changes in Annex 4.]

Annex 5  
  
RSTT in Europe

[Editor’s note: There are no changes in Annex 5.]

Annex 6  
  
Study on spectrum needs of Railway Radiocommunication System between Train and Trackside (RSTT) with respect to the train radio applications

[Editor’s note: There are no changes in Annex 6.]

Annex 7  
  
Mexico experience in the current usage of frequency bands   
for railway radiocommunication systems

[Editor’s note: There are no changes in Annex 7.]

Annex 8  
  
Consideration of the Doppler Effect in railway radiocommunication systems between high-speed trains and tracksides

[Editor’s note: There are no changes in Annex 8.]

Annex 9  
  
Information on country specific frequency bands used for Railway Radiocommunications Systems for Train and Trackside

Editor’s note: Depending on the …. to remove this annex to Report ITU-R M.2442

Editor’s note: Pending WRC-19 outcomes, WP5A will consider whether or not to establish a new study item for ITU-R Report on frequency arrangement of RSTT and will consider moving this Annex 2 from this Recommendation to a new or existing ITU-R Report. Noting d) in this Recommendation will also be amended accordingly.

This annex lists the frequency bands used for railway radiocommunications systems for train and trackside in the countries shown and expected to continue to be used to support railway operations in the future. [These bands may or may not accord with the recommended harmonized frequency ranges listed in Annex 1.

Section 1: Other frequency bands used to support railway systems in Region 1

Section 2: Other frequency bands used to support railway systems in Region 2

Section 3: Other frequency bands used to support railway systems in Region 3]

Australia

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency band | Main railway application | Signal characteristics | Other comments |
| 70-88 MHz | Train radio, shunting, maintenance | 6.25/12.5 kHz FM channels | Mainly voice and low-rate FSK data |
| 148-174 MHz | Train radio, shunting, maintenance | 6.25/12.5 kHz FM channels | Mainly voice and low-rate FSK data |
| 403-420 MHz | Train radio, shunting, maintenance | 6.25/12.5 kHz FM channels | Mainly voice and low-rate FSK data |
| 450-520 MHz | Train radio, shunting, maintenance | 6.25/12.5 kHz FM channels | Mainly voice and low-rate FSK data |
| 703-803 MHz | Train radio, train monitoring, location tracking, MB signaling | 3GPP LTE Rel.14 | Voice and broadband data |
| 803-960 MHz | Train radio, shunting, maintenance | Digital trunked systems | Voice and medium-rate data |
| 1 710-1 880 MHz | Train radio, train monitoring, location tracking, passenger intercom | 3GPP LTE Rel.14 | Voice and broadband data |

Korea (Republic of)

| Frequency band | Main railway application | Signal characteristics | Other comments |
| --- | --- | --- | --- |
| 148-174 MHz | Train radio, shunting, maintenance | 6.25/12.5 kHz FM channels | Mainly voice and low-rate FSK data |
| 703-748 MHz, 758‑803 MHz | Train radio (shunting, maintenance)  Train position  Train remote  Train surveillance | 3GPP LTE Rel.13  10 MHz channel | Voice and broadband train data including image |
| 806~856 MHz | Train radio | TRS | Voice and minimum rate of data |
| 0.984-7.484 MHz  27.09-27.10 MHz | Train position | Balise  (KRCS C244 03) | Train location data |
| 18 GHz | Train surveillance | 10 MHz channels (6) | High data rete video |