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| **Radiocommunication Study Groups** |  |
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| **11 May 2021** |
| **English only** |
| Annex 15 to Working Party 5A Chairman’s Report | |
| working document towards a preliminary draft new recommendation ITU-R M.[RSTT\_FRQ] | |
| Spectrum Harmonization for Railway Radiocommunication Systems  between Train and Trackside (RSTT) | |

Scope

This Recommendation recommends the use of frequency ranges to facilitate harmonization of frequency bands within the existing Mobile Service allocations for existing and future railway radiocommunication systems between train and tracksides (RSTT) on global or regional basis. Information on countries’ specific frequency bands used for RSTT are covered in Report ITU-R M.2442.

Keywords

Railway Radiocommunication Systems between Train and Trackside (RSTT), Train, Trackside, frequency ranges, frequency bands, harmonization

Abbreviations and Glossary

APT Asia-Pacific Telecommunity

ASMG Arab Spectrum Management Group

ATU African Telecommunications Union

CEPT European Conference of Postal and Telecommunications Administrations

MB Mobile Broadband

RCC Regional Commonwealth in the field of Communications

RSTT Railway Radiocommunication Systems between Train and Trackside

Harmonized frequency range: In the context of this Recommendation, a range of frequencies harmonized globally or regionally over which relevant radio equipment is envisaged to be capable of operating in specific frequency bands/conditions; however, the actual use may be limited according to national and regional conditions and requirements.

Railway radiocommunication systems between train and trackside: Radiocommunication systems providing improved railway traffic control, passenger safety and improved security for train operations

Related ITU Recommendations and Reports

1 Report ITU-R [M.2418](https://www.itu.int/pub/R-REP-M.2418) – *Description of Railway Radiocommunication Systems between Train and Trackside*

2 Report [ITU-R M.2442](http://www.itu.int/dms_pub/itu-r/opb/rep/R-REP-M.2442-2019-MSW-E.docx) – *Current and future usage of railway radiocommunication systems between train and trackside*

3 [Recommendation ITU-R SM.1896](https://www.itu.int/rec/R-REC-SM.1896/en) – *Frequency ranges for global or regional harmonization of short-range devices*

The ITU Radiocommunication Assembly,

considering

*a)* that railway transportation contributes to global economic and social development, especially for developing countries;

*b)* that the main categories of applications of RSTT are Train Radio, Train Positioning Information, Train Remote and Train Surveillance;

*c)* that many administrations wish to facilitate RSTT interoperability, in particular for cross-border operations, effective use of spectrum resources and for minimizing the risk of interference;

*d)* that information and radiocommunication technologies in railway radiocommunication systems between train and trackside provide improved railway traffic control, passenger safety and improved security for train operations, and benefit from using frequency bands allocated to mobile service on primary basis;

*e)* that the deployment of RSTT requires significant infrastructure investment and would benefit from a stable radio spectrum regulatory environment;

*f)*  that international standards and harmonized spectrum facilitate deployment of RSTT based on readily available cost-effective technologies that would help to provide economies-of-scale for the railway industry;

*g)* that in general, spectrum harmonization of Train Radio application of RSTT may have priority over other RSTT applications, because Train Radio application requires high reliability and quality of services for the safety for train operations;

*h)* that some national and international railway organizations and standards bodies have begun investigating and developing specifications for new technologies for railway radiocommunication systems;

*i)* that implementation of future RSTT needs to take into account the development of railway industry and relevant standards;

*j)* that the evolving safety related applications of railway transportation may require more spectrum;

*k)* that there may be a need to integrate different technologies in order to facilitate various functions, for instance dispatching commands, operating control and data transmission, into railway train and trackside systems to also meet the needs of a high-speed railway environment,

recognizing

*a)* that Report ITU-R M.2418 provides the architecture, applications, technologies and operational scenarios of Railway Radiocommunication Systems between Train and Trackside (RSTT) for all types of trains (e.g. high-speed trains, passenger trains, freight trains, and metro trains);

*b)* that Report ITU‑R M.2442 provides technical and operational characteristics and the spectrum usage of current and future Railway radiocommunication Systems between Train and Trackside (RSTT) as well as countries’ specific frequency bands used for RSTT;

*c)* that Recommendation ITU-R SM.1896 contains Frequency ranges for global or regional harmonization of short-range devices,

noting

*a)* that spectrum planning for RSTT is performed at the national level, taking into account the need for interoperability and benefits of neighbouring administrations using harmonized frequency bands;

*b)* that cooperation among all involved parties (administrations and railway organisations), will facilitate spectrum harmonization for RSTT;

*c)* that the growth and evolution of the railway transportation systems may require administrations to follow the development of applicable standards to ensure coexistence with other applications operated in the same band and/or in the adjacent bands;

*d)* that some railway systems have been operating in many countries for many years using various frequency bands not necessarily listed in Annex 1, and that these frequency bands will continue to be used for RSTT in the future and require ongoing support;

*e)* that the provisions of RR Nos. **1.59** and **4.10** do not apply for railway radiocommunication systems,

recommends

Editor’s notes :this recommends part will be reviewed depending on the structure of Annexes

Editor’s notes: 2 options were proposed for Recommends part.

*Option 1: To have 2 separated* recommends *items*

1 that administrations should consider using the frequency bands, or parts thereof, that are allocated to the mobile service on primary basis within the harmonized frequency ranges listed in Table 1 of Annex 1;

2that administrations should take into account the frequency bands, or parts thereof, that are allocated to the mobile service on primary basis within the frequency ranges listed in Table 2 of the Annex 1 when considering other possible spectrum harmonization for RSTT;

3that administrations should make all necessary efforts to ensure cross border coexistence between RSTT and other systems operating in the mobile service as well as between RSTT and stations of other services.

*Option 2: To merger above 2 separated* recommends *items*

1that administrations should consider using frequency bands for RSTT, within mobile service on primary basis, within the frequency ranges (or parts thereof), listed in Annex 1, in achieving regional or global spectrum harmonization for RSTT;

2that administrations should make all necessary efforts to ensure cross border coexistence between RSTT and other systems operating in the mobile service as well as between RSTT and stations of other services.

ANNEX 1 GLOBAL

Note: this annex will be updated according to material received to the next meetings, if any.

ANNEX 2 Region 1

*Option 1: to have 2 separated tables*

Table 1

Harmonised frequency ranges for RSTT

|  |  |
| --- | --- |
|  | Region 1 |
| Train Radio | 876-880 MHz / 921-925 MHz |
| Train Positioning | See Note 1 |
| Train Remote | See Note 1 |
| Train Surveillance | See Note 1 |

Note 1: No Frequency ranges for this RSTT application are harmonized at this time.

[Editor’s note: CEPT is of the view that regional and global harmonisation can only be achieved if there is overlapping spectrum in the related harmonisation measures of the regional groups or their sub-regional entities.]

Table 2

Frequency ranges under consideration for a possible regional/global spectrum harmonization for RSTT proposed from within sub regional groups in Region 1

|  | Region 1 |
| --- | --- |
| Train Radio | ATU:  138-170 MHz,  406.1-430 MHz,  440-470 MHz;  873-876 MHz/ 918‑921 MHz |
| ASMG: TBD |
| CEPT[[1]](#footnote-1) |
| RCC[[2]](#footnote-2):  138-174 MHz;  406.2-430 MHz / 440‑470 MHz; |
| Train Positioning | CEPT:  0.984-7.484 MHz  27.09-27.10 MHz |
| Train Remote | RCC2:  138-174 MHz;  406.2-430 MHz /440‑470 MHz;  876-880 MHz / 921‑925 MHz |
| Train Surveillance |  |

*Option 2: to merger above 2 separated tables into 1 table (Table 1bis)*

Table 1*bis*

Frequency Ranges for Harmonization for the train radio application of RSTT in Region 1

|  |  |  |  |
| --- | --- | --- | --- |
|  | Region 1 | | |
|  | Frequency ranges considered for harmonization by sub-Regional groups | Harmonized Frequency ranges in Region 1 |
| Train Radio | ATU:  138-170 MHz, 406.1-430 MHz, 440-470 MHz; 873‑880 MHz / 918‑925 MHz | 876-880 MHz / 921-925 MHz |
| ASMG:  876-880 MHz / 921-925 MHz |
| For CEPT[[3]](#footnote-3):  876-880 MHz / 921-925 MHz |
| RCC[[4]](#footnote-4):  138–174 MHz;  406.2–430 MHz /440–470 MHz; 876-880 MHz / 921‑925 MHz |
| Train Positioning | CEPT:  0.984-7.484 MHz  27.09-27.10 MHz | See Note 1 |
| Train Remote | RCC4: 138-174 MHz; 406.2-430 MHz / 440‑470 MHz; 876-880 MHz / 921-925 MHz | See Note 1 |
| Train Surveillance | See Note 1 | See Note 1 |

Note 1: No Frequency ranges for this RSTT application are harmonized at this time.

[Editor’s note: CEPT is of the view that regional and global harmonisation can only be achieved if there is overlapping spectrum in the related harmonisation measures of the regional groups or their sub-regional entities.]

ANNEX 3 Region 2

*Option 1: to have 2 separated tables*

Table 1

Harmonised frequency ranges for RSTT

|  |  |
| --- | --- |
|  | Region 2 |
| Train Radio |  |
| Train Positioning |  |
| Train Remote |  |
| Train Surveillance |  |

Table 2

Frequency ranges under consideration for a possible regional/global spectrum   
harmonization for RSTT proposed from within regional groups

|  |  |
| --- | --- |
|  | Region 2 |
| Train Radio |  |
|
|
|
| Train Positioning |  |
| Train Remote |  |
| Train Surveillance |  |

*Option 2: to merger above 2 separated tables into 1 table (Table 1bis)*

Table 1*bis*

Frequency Ranges for Harmonization for the train radio application of RSTT in Region 2

|  |  |  |  |
| --- | --- | --- | --- |
|  | Region 2 | | |
|  | Frequency ranges considered for harmonization by Regional group | Harmonized Frequency ranges in Region 2 |
| Train Radio |  |  |
| Train Positioning |  |  |
| Train Remote |  |  |
| Train Surveillance |  |  |

ANNEX 4 Region 3

Table 2

Frequency ranges under consideration for a possible regional/global spectrum harmonization for RSTT proposed from within regional groups

|  |  |
| --- | --- |
|  | Region 3 |
| Train Radio | 70-74.8 MHz, 75.2-88 MHz, 142-144 MHz, 146-149.9 MHz, 150.05-156.4875 MHz, 156.5625-156.7625 MHz, 156.8375‑161.9625 MHz, 161.9875-162.0125 MHz, 162.0375‑170 MHz, 335.4-399.9 MHz, 406.1-430 MHz, 440‑470 MHz, 703-748 MHz, 758-803 MHz, 873-915 MHz, 918-960 MHz, 1 770-1 880 MHz, 1 965-1 975 MHz, 2 155‑2 165 MHz 43.5-45.5 GHz, 92-94 GHz, 94.1-100 GHz, 102-109.5 GHz  138-174 MHz, 335.4-470 MHz, 703-748 MHz, 758-803 MHz, 873-915 MHz, 918‑960 MHz, 1 770-1 880 MHz, 43.5‑45.5 GHz and 92-109.5 GHz |
|
|
|
| Train Positioning | See Note 1 |
| Train Remote | See Note 1 |
| Train Surveillance | See Note 1 |

Note 1: No Frequency ranges for this RSTT application are harmonized at this time.

Methodologies for achieving global or regional spectrum harmonisation for RSTT are provided in Appendix.

Table 1

Frequency Ranges for Harmonization for the train radio application of RSTT

|  | Region 3 | | |
| --- | --- | --- | --- |
|  | Frequency ranges considered for harmonization | Harmonized Frequency ranges in Region 3 |
| Train Radio | 70-74.8 MHz, 75.2-88 MHz, 142-144 MHz, 146‑149.9 MHz, 150.05-156.4875 MHz, 156.5625‑156.7625 MHz, 156.8375-161.9625 MHz, 161.9875-162.0125 MHz, 162.0375-170 MHz, 335.4‑399.9 MHz, 406.1-430 MHz, 440-470 MHz, 703-748 MHz, 758-803 MHz, 873-915 MHz, 918‑960 MHz, 1 770-1 880 MHz, 1 965-1 975 MHz, 2 155-2 165 MHz 43.5-45.5 GHz, 92-94 GHz, 94.1‑100 GHz, 102‑109.5 GHz  138-174 MHz, 335.4-470 MHz, 703-748 MHz, 758‑803 MHz, 873-915 MHz, 918‑960 MHz, 1 770‑1 880 MHz, 43.5-45.5 GHz and 92-109.5 GHz[[5]](#footnote-5) | See Note 1 |
| Train Positioning | See Note 1 | See Note 1 |
| Train Remote | See Note 1 | See Note 1 |
| Train Surveillance | See Note 1 | See Note 1 |

Note 1: No Frequency ranges for this RSTT application are harmonized at this time.

Methodologies for achieving global or regional spectrum harmonisation for RSTT are provided in Appendix.

[APPENDIX

*{Editors Note: This is a collection of different methodologies used in different regions and need to be further considered.}*

Methodologies of harmonizing frequencies for RSTT

Methodology 1

The following text shows how to develop Table 1 in Annex 1 as “harmonized frequency ranges” with “logical OR approach” and within existing mobile-service allocations which are principle condition of Resolution **240 (WRC-19)**.

For example, in a case of spectrum usage in 300-500 MHz extracted from Figure 5 “Train Radio(300-3 000 MHz) in Chapter 8 Spectrum Usage of RSTT in a Report ITU-R M.2442 which visualizes “the technical and operational parameters/characteristics of RSTT systems provided by Administrations” in Chapter 6 in the same Report, for example, Region 3 from that spectrum map is shown below. Then a wide frequency range is calculated with logical OR from each frequency bands. Finally, the frequency range is filtered and separated with the condition of existing mobile-service allocations as seen in the figure below.

With this “logical OR approach”, each frequency could be involved in harmonized frequency ranges and each administration would use those frequency ranges or part of thereof for RSTT on their national needs, spectrum requirements, policy objectives, and operating environments which satisfies *considering n)* of this Recommendation.



(1)Logical OR from each frequency

(2)Within existing mobile-service allocations

Harmonized frequency ranges

With this “logical OR approach” mentioned above, each cell of the table-1*bis* in *recommends* part are filled based on the table in recommends which reflect input contribution, and the excel file in Chapter 6 of Report ITU-R M.2442 as well, with the procedure as follows:

1) Selecting “Summary” sheet attached in Chapter 6 in a Report ITU-R M.2442.

2) Filling the application column with 4 categories, i.e., TRN RAD, TRN POS INFO, TRN REMOTE, and TRN SURV CCTV in accordance with the parameters/characteristics tables in Chapter 7 of a Report ITU-R M.2418, which addresses the technical and operational characteristics for RSTT.

3) Splitting into 4 sheets according to 4 categories.

4) Sorting each sheet by frequency.

5) Grouping rows in each sheet with frequency ranges.

6) Extracting the lowest and the highest frequencies among each group.

7) Filtering them with the condition of existing mobile-service allocations and get frequency ranges.

8) Filling all the frequency ranges got by step 7) into the table 1*bis* in recommends part in a working document towards preliminary draft new Recommendation ITU-R M.[RSTT\_FRQ].

Methodology 2

The regional and global harmonization can only be achieved if there is overlapping spectrum in the related harmonization measures of the regional groups or their sub-regional entities.]

1. CEPT is currently undertaking studies on spectrum needs and an identification of suitable bands for European-wide harmonisation for RSTT. To this regard, CEPT was mandated by the European Commission to study the paired frequency bands 874.4-880 MHz/919.4-925 MHz and the unpaired frequency band 1 900-1 920 MHz. Further spectrum bands, for example the band 2 290-2 400 MHz on a tuning range basis, may also be studied. [↑](#footnote-ref-1)
2. It is frequency tuning band and will be limited to use by these systems according to national and regional constraints, conditions and requirements. [↑](#footnote-ref-2)
3. CEPT is currently undertaking studies on spectrum needs and an identification of suitable bands for European-wide harmonisation for RSTT. To this regard, CEPT was mandated by the European Commission to study the paired frequency bands 874.4-880 MHz/919.4-925 MHz and the unpaired frequency band 1 900-1 920 MHz. Further spectrum bands, for example the band 2 290-2 400 MHz on a tuning range basis, may also be studied. [↑](#footnote-ref-3)
4. It is frequency tuning band and will be limited to use by these systems according to national and regional constraints, conditions and requirements. [↑](#footnote-ref-4)
5. China is currently studying and planning to make deployment of next generation of RSTT for railway broadband mobile communications on 2 100 MHz bands (1 965-1 975, 2 155-2 165 MHz). [↑](#footnote-ref-5)