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| **Radiocommunication Study Groups** |  |
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| Annex 5 to Working Party 5A Chair’s Report | |
| working document towards a preliminary draft new recommendation ITU-R M.[RSTT\_FRQ] | |
| Harmonization of spectrum for existing and future Railway Radiocommunication Systems between Train and Trackside (RSTT)  within the frequency bands allocated to the mobile service | |

(…)

*[Note:*

*There’s no consensus on some elements contained in this document at this stage, in particular the recommend section. Further works need to be done with the view to address the concerns expressed at the May meeting of WP 5A.]*

Scope

This Recommendation provides 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.

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

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 cooperation among all involved parties (administrations and railway organisations), would facilitate the RSTT deployment;]

*c)* that the main categories of applications of RSTT are Train Radio, Train Positioning Information, [Train Integrity Management System,] Train Remote and Train Surveillance;

[Editor’s note: Explanation on the relationship between Train Positioning Information and EoT(End of Train) and HoT(Head of Train) needs to be provided by CITEL.]

[Editor’s note: To provide contribution regarding the new category of Train Integrity Management System, such as description, frequency, etc.]

*d)* 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;

*e)* 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;

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

*g)*  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;

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

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

*j)* that implementation of future RSTT needs to take into account the development of railway industry and relevant standards as well as regional and national priorities;

*k)* that the evolving traffic safety related applications of railway transportation may require additional spectrum considerations;

*l)* that there may be a need to interoperate 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 planned 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, *[Editor’s Note: USA – what is the relevance of SM.1896 here?]*

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

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

*c)*

*e)*

*f)* that the continued growth and evolution of RSTT systems may require further sharing and compatibility studies to ensure coexistence and protection of other incumbent services in the same and/or adjacent bands;

*g*) that railway technologies are heading to autonomous driving without track circuit, and so multiple radiocommunication systems are one of the effective ways to keep train integrity based on present location of the moving trains;

recommends

1that administrations should consider using the frequency ranges (or parts thereof), as listed in the Annexes, within the bands allocated to the mobile service on primary basis, in order to facilitate regional or global spectrum harmonization for RSTT;

2that administrations should take practicable 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;

[3 that the technical and operational characteristics of RSTT should be regularly reviewed, as appropriate, to assess the impact of these characteristics on sharing and compatibility, and to take into account the results of these reviews in the development and/or revision of ITU-R Recommendations/Reports addressing, *inter alia*, if necessary, applicable measures to mitigate the risk of interference from RSTT into incumbent services;]

[4 that administrations wishing to implement RSTT should utilize frequency bands identified for RSTT in the Radio Regulations. Implementing RSTT in any frequency bands not considered for RSTT in the Radio Regulations or studied by ITU-R should not be allowed, should be treated under Article 4.4 of the RR, and should be on a non-exclusive, non-interference and non-protected basis;]

ANNEX 1

Global

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

ANNEX 2

Region 1

Table A2-1

Frequency ranges harmonized or considered for harmonization for RSTT in Region 1

|  | Region 1 | | |
| --- | --- | --- | --- |
| Applications | Frequency ranges within the existing mobile service allocations under consideration or proposed for harmonization by sub-Regional groups | Harmonized frequency ranges within the existing mobile service allocations 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:  **GSM-R**  876-880 MHz / 921-925 MHz  **Trunked radio**  138-174 MHz [[1]](#footnote-1)  410-430 MHz 1  **CBTC & TCS**  2 400-2 483.5 MHz  5 915-5 945 MHz 1 |
| CEPT[[2]](#footnote-2),[[3]](#footnote-3):  874.4-880 MHz / 919.4-925 MHz,  1 900-1 910 MHz |
| RCC[[4]](#footnote-4):  138-174 MHz;  406.2-430 MHz /440-470 MHz; 876-880 MHz / 921‑925 MHz |
| Train Positioning | CEPT2:  27.09-27.10 MHz[[5]](#footnote-5)  ASMG:  **Eurobalise**  4.059-4.409 MHz  27.09-27.10 MHz  **Speed measurement radars**  24.050-24.25 GHz | See Note 1 |
| Train Remote | RCC3: 138-174 MHz; 406.2-430 MHz / 440‑470 MHz; 876-880 MHz / 921-925 MHz  ASMG:  **Tower Control**  440-449 MHz1 | See Note 1 |
| Train Surveillance | See Note 1  ASMG:  2 400-2 483.5 MHz1  5 150-5 350 MHz1  5 725-5 875 MHz1 | See Note 1 |
| Note 1: No Frequency ranges within the existing mobile service allocations for this RSTT application are harmonized at this time. | | |

ANNEX 3

Region 2

Table A3-1

Frequency ranges harmonized or considered for harmonization for RSTT in Region 2

| Region 2 | | |
| --- | --- | --- |
| Application | Frequency ranges within the existing mobile service allocations under consideration or proposed for harmonization | Harmonized frequency ranges within the existing mobile service allocations in Region 2[[6]](#footnote-6) |
| Train Radio | USA: | At least two Adm: 148-174 MHz  More number of Adm: 160.215-161.565 MHz  Greater range of frequencies with at least one Adm: 136-174 MHz  At least two Adm:  410-450 MHz and 450-470 MHz  More number of Adm: 452.95-457.00 MHz  Greater range of frequencies with at least one Adm: 410-470 MHz  At least two Adm: 898.4-928 MHz  More number of Adm: 902-928 MHz  Greater range of frequencies with at least one Adm: 800-930 MHz  At least two Adm: 1.5 GHz. 2-10.5 GHz and 17.7-18.0 GHz  More number of Adm: 7 110-7 125 MHz  Greater range of frequencies with at least one Adm: 1.427-19.7 GHz |
| 160.215-161.565 MHz 452.92500/457.92500 MHz 452.95000/457.95000 MHz 2 000-18 000 MHz |
| CAN: |
| 160.170-161.580 MHz 452/457 MHz |
| B: |
| 148-174 MHz  380-400 MHz (TETRA) Parts of 403-470 MHz 459.7875-469.7875 MHz 900-930 MHz 1.5 GHz 2.4 GHz 6.5 GHz 7.5 GHz 10.5 GHz |
| ARG: |
| 4.5-7 MHz  150-170 MHz  410-450 MHz 450-470 MHz 490-512 MHz 800-900 MHz 1 427-1 525 MHz 7 110-7 725 MHz 17 700-19 700 MHz |
| MEX: 160-174 MHz 350-380 MHz 898.4-901/943.4-946 MHz 6 425 - 7 125 MHz |
| JMC:  162.0375-174 MHz 902-928 MHz 450-470 MHz 21 200-23 600 MHz |
| BOL: 136-174 MHz |
| Train Positioning | USA: | At least two Adm: 220-222 MHz  More number of Adm: 220-222 MHz  Greater range of frequencies with at least one Adm: 219.5-222 MHz  At least two Adm:  896-897 MHz and 900-935 MHz  More number of Adm: 452.95-457.00 MHz  Greater range of frequencies with at least one Adm: 896-936 MHz  At least two Adm: 459-469 MHz  More number of Adm: 459-469 MHz  Greater range of frequencies with at least one Adm: 450-470 MHz  For EoT/HoT:  At least two Adm: 452,00 - 460,00 MHz More number of Adm: 452,9375 - 457,9375 MHz Greater range of frequencies with at least one Adm: 450,00 - 469,7875 MHz |
| 44 MHz 219.500-222 MHz(\*)  452.9375-457.9375 MHz(\*) |
| 896.8875-897.9875 MHz 935.8875-936.9875 MHz 902-928 MHz |
| BOL:  450-460 MHz(\*) |
| CAN:  452.9375-457.9375 MHz(\*) 896/935 MHz 902-922 MHz |
| B: |
| 157-170 MHz (VHF Digital) |
| 459.4375-469.7875 MHz(\*) |
| 900-930 MHz |
| 2.4 GHz |
| 5 GHz |
| ARG: |
| VHF = 240 MHz – 300 MHz |
| UHF = 410 MHz – 450 MHz |
| UHF = 450 MHz – 470 MHz  458.075 MHz(\*) |
| UHF = 470 MHz – 490 MHz |
| MEX: 220-222 MHz 400 MHz  452-458 MHz(\*) |
| JMC: 26.4200-27.5000 MHz 3.75-4.0 MHz 4.4880-4.6500 MHz |
| ~~[Train Positioning sub-group]~~  ~~EoT/HoT~~ | ~~CAN: 452.9375-457.9375 MHz~~ | ~~At least two Adm: 452.00-460.00 MHz~~  ~~More number of Adm:  452.9375-457.9375 MHz~~  ~~Greater range of frequencies with at least one Adm: 450.00-469.7875 MHz~~ |
| ~~USA: 219.5-222 MHz 452.9375-457.9375 MHz~~ |
| ~~ARG: 458.075 MHz~~ |
| ~~BOL: 450-460 MHz~~ |
| ~~B: 459.4375-469.7875 MHz~~ |
| ~~MEX: 452-458 MHz~~ |
| Train Remote | USA: | At least two Adm: 452.00-457.96875 MHz  More number of Adm:  452.9000-452.96875 MHz  Greater range of frequencies with at least one Adm: 452.00-458.00 MHz  USA and CAN report 220 MHz |
| 220.9625-221.00 MHz 221.9625-220.00 MHz 452.9000-452.96875 457.9000-457.96875 MHz |
| CAN: 812/857 MHz 452/457 MHz 220 MHz |
| MEX: 452-458 MHz |
| B: 2.4 GHz |
| Train Surveillance | B: 403-470 MHz (under implementation) | See Note 1 |
| JMC: 4 800-4 990 MHz 5 470-5 725 MHz (under implementation) |

Note 1: No possible frequency ranges to be harmonized were found at the time of preparing this document.

Note: Values in grey correspond to ranges not consistent with any other Administration for that type of system.

(\*)These frequency ranges are used for EoT/HoT

ANNEX 4

Region 3

Table A4-1

Frequency ranges harmonized or considered for harmonization for RSTT in Region 3

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|  | Region 3 | |
| Application | Frequency ranges within the existing mobile service allocations under consideration for regional harmonization | Harmonized frequency ranges within the existing mobile service allocations in Region 3 |
| Train Radio | VHF Band: 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,  162.0375‑174 MHz | See Note X. |
| UHF Band: 335.4-399.9 MHz, 406.1-430 MHz, 440­470 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 |
| SHF Band: 43.5-45.5 GHz, 92-94 GHz, 94.1-100 GHz,  102-109.5 GHz |
| Train Positioning | 1 676-1 740 kHz, 27.09-27.10 MHz[[7]](#footnote-7), 718‑728 MHz,  773‑783 MHz, 910.1-914.1 MHz | See Note X. |
| Train Remote | Under study | See Note X. |
| Train Surveillance | 703-748 MHz, 758-803 MHz, 18.86-18.92 GHz, 19.20‑19.26 GHz, 43.5-43.7 GHz, 57-66 GHz, 92‑94 GHz. 94.1-100 GHz, 102‑109.5 GHz | See Note X. |

*Note X: No Frequency ranges* within the existing mobile service allocations *for this RSTT application are harmonized at this time.*

Methodologies for achieving regional spectrum harmonization for RSTT in Region 3 are provided in the attachment to this Annex.

Attachment to Annex 4

Methodologies of harmonizing frequencies for RSTT in Region 3

The following text shows the methodology used in Region 3 to identify frequencies for regional harmonization for RSTT employing the “logical OR approach”.

For example, according to the materials provided by some administrations within Region 3 in Report ITU-R M.2442, spectrum usage for RSTT in 300-500 MHz within Region 3 are shown below. A wide frequency range can be 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.

Diagram

Description automatically generated

1. This is a frequency tuning range used by some ASMG administrations according to their national needs and technical/regulatory conditions. [↑](#footnote-ref-1)
2. In accordance to the ECC Decision (20)02 on the harmonised use of the paired frequency bands 874.4‑880.0 MHz and 919.4-925.0 MHz and of the unpaired frequency band 1 900-1 910 MHz for Railway Mobile Radio (RMR). [↑](#footnote-ref-2)
3. CEPT is of the view that 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. [↑](#footnote-ref-3)
4. This is a frequency tuning range and will be limited to use by these systems according to national and regional constraints, conditions and requirements. [↑](#footnote-ref-4)
5. In CEPT, the frequency range 27.09-27.10 MHz is harmonised for Balise tele-powering and downlink (train to ground) systems including Eurobalise and activation of the Loop/Euroloop, along with the frequency range 0.984-7.484 MHz harmonised for Eurobalise transmissions, i.e. Balise uplink (ground to train) with a centre frequency of 4.234 MHz (see ERC Recommendation 70-03 Annex 4). [↑](#footnote-ref-5)
6. These frequency ranges have not been harmonized yet and they are still under study in Region [↑](#footnote-ref-6)
7. This frequency range will operate along with the 3.951-4.516 MHz. [↑](#footnote-ref-7)