**3GPP TSG-RAN WG4 Meeting # 98-bis-e R4-210XXXX**

**Electronic Meeting, 12th – 20th April, 2021**

**Agenda item: 7.43 and 7.44**

**Source:** Moderator (UIC, International Union of the Railways)

**Title:** Email discussion summary for [98-bis-e][127] 900/1900MHz spectrum for Rail Mobile Radio in Europe

**Document for:** Information

# Introduction

This email discussion addresses the subject under agenda items 7.43 and 7.44 to provision spectrum blocks in 900 MHz and 1900 MHz in 5G NR for rail communication usage in Europe.

***Background [Start]***

The European spectrum regulation represented by CEPT has assigned two spectrum blocks for use by rail communication in Europe with Decision (20)0 (https://docdb.cept.org/document/16736).

Some important background information for the discussion on the specific spectrum blocks resulting from Decision (20)02 are listed here.

**General (clause 3)**

* paired frequency bands 876-880 MHz (train-to-ground) and 921-925 MHz (ground-to-train) are used for GSM-R as defined in Commission Decision 1999/569/EC and were harmonized in ECC Decision (02)05 [4];
* that the paired frequency bands 873-876 MHz and 918-921 MHz may be used on a national basis as extension bands for GSM-R as considered in ECC Decision (19)02 [7];
* The least restrictive technical conditions (LRTC) for wideband RMR in 1900-1910 MHz assume that MFCN base stations (BS) receiving above 1920 MHz have an enhanced selectivity compared to the current Harmonised European Standards, which would facilitate coexistence with RMR BS transmitting up to 65 dBm e.i.r.p., and that current MFCN BS located near an RMR radio site may need to be adapted so that they do not suffer interference;
* Operators of commercial mobile networks in 1920-1980 MHz should have, sufficiently far in advance, information on the rollout of a new RMR BS in 1900-1910 MHz;
* ECC Report 229 [13] proposes a systematic approach based on a coordination/cooperation process and guidelines for the dialogue between RMR and MFCN licensees as well as with the spectrum administration and that CEPT Report 74 gives an example of a coexistence criterion as part of a national coordination procedure;

**900MHz [874.4-880/919.4-925MHz FDD (2x 5.6MHz)](Annex 2)**

* For GSM-R, the following parameters apply:

GSM-R DL centre frequency fDL = 921 MHz + n×0.2 MHz where {n∈Z │ -7≤n≤19}

GSM-R UL centre frequency fUL = fDL – 45 MHz

GSM-R channel bandwidth is 200 kHz

uncoordinated deployment: GSM-R channel BW Maximum e.i.r.p. 200 kHz = 70.5 dBm + (fDL – 921) × 40/3 dB

* For radio access technologies other than GSM-R, the following parameters apply:

The BEM is developed on the basis that detailed coordination and cooperation agreements would not be required to be in place prior to network deployment. Only non-AAS BS are considered.

The lower edge of the lowest Resource Block shall be 919.6 MHz. RMR channel BW Maximum e.i.r.p.

* For any of the channel BW following value may be used by an administration in case an upper bound is desired:

Min {65 dBm/channel, Maximum e.i.r.p. specific to the channel BW}

Specific in-block requirements for 5.6 MHz and 5 MHz channels mandatory for uncoordinated deployment

RMR channel BW Maximum e.i.r.p.

5.6 MHz = 62 dBm/5.6 MHz

5 MHz = 64.5 dBm/5 MHz + (fDL – 922.1) × 40/3 dB

fDL is the centre frequency in MHz.

**1900MHz [1900-880/919.4-925MHz FDD (2x 5.6MHz)](Annex 3)**

* The BEM is developed on the basis that detailed coordination and cooperation agreements would not be required to be in place prior to network deployment. Only non-AAS BS are considered.

The following parameters apply mandatory for uncoordinated deployment

RMR channel BW Maximum e.i.r.p. 10 MHz = 65 dBm/10 MHz

Frequency range e.i.r.p. limit 1920-1980 MHz -43 dBm/5 MHz

**Others:**

Today GSM-R uses the bands R-GSM and ER-GSM according to 3GPP TS 45.005, which includes the spectrum ranges P-GSM and E-GSM (corresponds to band B8/n8).

***Background [End]***

List of candidate target of email discussion for 1st round and 2nd round

* 1st round: Common understanding about the Rail Mobile Radio WID 900/1900MHz targets and limits;
* 2nd round: Consolidate objectives if necessary, next steps;

# Topic #1: Rail Mobile Radio 900MHz spectrum block

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| T-doc number | Company | Proposals / Observations |
| R4-2107312 | Huawei | Observation 1: Some description in the WID are deployment related, it should be clear that the newly introduced band shall not have impact to the incumbent deployed network.  Observation 2: Requirement of BEM in the WID objective needs to be clarified.  Observation 3: It’s not clear whether some regional regulatory requirements need to be considered to define some UE band specific requirements.  Observation 4: Selection of channel raster of RMR 900MHz band should consider the technical conditions in ECC Decision (20)02.  Proposal 1: It is proposed to have some clarification of the WID objectives and make clear of the aspects to be studied in both BS and UE sides.  Proposal 2: Make clear that the newly introduced RMR bands shall not have impact to the deployed network. |

## Open issues summary

### Sub-topic 1-1 RMR WI objectives

**Issue 1-1: WI objectives impacting BS and UE;**

Companies should consider that that RMR 900 is only applicable for Europe.

ECC Decision (20)02 already defines restrictions for the use of the BS and two use cases (Cab Radio PC-1, non-Cab Radio PC-3) are provided for the UE. The present RMR 900 WI deals exclusively with the use of PC-1, PC-3 is accordingly considered separately.

Co-existence RMR 900MHz spectrum block in adjacency to other spectrum blocks (e.g. B8/n8) and BEM requirements;

Companies are invited, if necessary, to suggest detailing WI objectives.

## Companies views’ collection for 1st round

### Open issues

| Company | Comments |
| --- | --- |
| Ericsson | The observations made by Huawei are relevant. RAN4 doesn’t specify BEM requirement.  To address those concerns, we would propose the following improvements to the WID:   1. Replace:    * The Block-Edge-Mask (BEM) is developed on the basis that detailed coordination and cooperation agreements would not be required to be in place prior to network deployment.   With   * + Transpose the Block-Edge-Mask (BEM) specified in ECC Decision (20)02 in corresponding RAN4 BS RF requirements.  1. Add    * Specify the system parameters for this new band considering the technical conditions defined in ECC Decision(20)02.    * Specify UE RF requirements if necessary, including the consideration of A-MPR to address the potential impact of regional regulatory requirements. |
| Huawei | Sub-topic 1-1:  OK with the proposed changes by Ericsson. Meanwhile, since RMR 900MHz is a newly introduced band, which should not cause co-existence issues for the existing networks with band 8/n8. As we the changes for BEM remove some information related to deployment, we propose to add a Note under the objectives:  Note: Introduction of 900MHz band for Rail Mobile Radio use shall not cause co-existence interference issues for adjacent band 8/n8 and shall not have impact to the incumbent deployed network. |

## Summary for 1st round

### Open issues

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| --- | --- |
|  | **Status summary** |
| **Sub-topic #1** | *Agreements:*  The proposed changes to the WID objectives by Ericsson address the concerns raised by contribution R4-2107312, considers the regulatory regional requirements according to ECC Decision (20)02. It can be assumed that the proposed changes can be endorsed.  *Recommendations for 2nd round:*  2nd round need to clarify if the proposed NOTE is necessary or requires some updates? |

## Discussion on 2nd round (if applicable)

|  |  |
| --- | --- |
| Company | Comments |
| Huawei | We think the note is necessary as the general principle in RAN4 for a newly introduced band is to well protect the existing operating bands, which may have impact on assumptions for specifying the RF requirements for the new band. Thus some clear criteria should be captured in the WID.  Note: Introduction of 900MHz band for Rail Mobile Radio use shall not cause co-existence interference issues for adjacent band 8/n8 and shall not have impact to the incumbent deployed network. |
| Vodafone | Support the note proposed by Huawei. Also OK with the changes proposed by Ericsson in round 1. |
|  |  |

# Topic #2: Rail Mobile Radio 1900MHz spectrum block

## Companies’ contributions summary

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| --- | --- | --- |
| T-doc number | Company | Proposals / Observations |
| R4-2107313 | Huawei | Observation 1: Some description in the WID are deployment related, it should be clear that the newly introduced band shall not have impact to the incumbent deployed network.  Observation 2: Requirement of BEM in the WID objective needs to be clarified.  Observation 3: It’s not clear whether some regional regulatory requirements need to be considered to define some UE band specific requirements.  Proposal 1: It is proposed to have some clarification of the WID objectives and make clear of the aspects to be studied in both BS and UE sides.  Proposal 2: Make clear that the newly introduced RMR bands shall not have impact to the deployed network. |

## Open issues summary

### Sub-topic 2-1 RMR WI objectives

**Issue 2-1: WD objectives impacting BS and UE;**

Companies should consider that that RMR 1900 is only applicable for Europe.

ECC Decision (20)02 already defines restrictions for the use of the BS and two use cases (Cab Radio PC-1, non-Cab Radio PC-3) are provided for the UE. The present RMR 1900 WID deals exclusively with the use of PC-1, PC-3 is accordingly considered separately.

Co-existence RMR 1900MHz spectrum block in adjacency to other spectrum blocks (e.g. B1/n1 and B3/n3) and BEM requirements;

Companies are invited, if necessary, to suggest detailing WI objectives.

## Companies views’ collection for 1st round

### Open issues

| Company | Comments |
| --- | --- |
| Ericsson | The observations made by Huawei are relevant. RAN4 doesn’t specify BEM requirement.  To address those concerns, we would propose the following improvements to the WID:   1. Replace:    * The Block-Edge-Mask (BEM) is developed on the basis that detailed coordination and cooperation agreements would not be required to be in place prior to network deployment.   With   * + Transpose the Block-Edge-Mask (BEM) specified in ECC Decision (20)02 in corresponding RAN4 BS RF requirements.  1. Add:    * Specify UE RF requirements if necessary, including the consideration of A-MPR to address the potential impact of regional regulatory requirements. |
| Huawei | OK with the proposed changes by Ericsson. Meanwhile, since RMR 1900MHz is a newly introduced band, which should not cause co-existence issues for the existing networks with band 1/n1. As we the changes for BEM remove some information related to deployment, we propose to add a Note under the objectives:  Note: Introduction of 1900MHz band for Rail Mobile Radio use shall not cause co-existence interference issues for adjacent band 8/n8 and shall not have impact to the incumbent deployed network. |

## Summary for 1st round

### Open issues

*Moderator tries to summarize discussion status for 1st round, list all the identified open issues and tentative agreements or candidate options and suggestion for 2nd round i.e. WF assignment.*

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| --- | --- |
|  | **Status summary** |
| **Sub-topic#1** | *Agreements:*  The proposed changes to the WID objectives by Ericsson address the concerns raised by contribution R4-2107313, considers the regulatory regional requirements according to ECC Decision (20)02. It can be assumed that the proposed changes can be endorsed.  *Recommendations for 2nd round:*  2nd round need to clarify if the proposed NOTE is necessary or requires some updates? |

## Discussion on 2nd round

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| --- | --- |
| Company | Comments |
| Huawei | Similar comments as in Section 1.5. Typo is corrected for the 1900M note below.  Note: Introduction of 1900MHz band for Rail Mobile Radio use shall not cause co-existence interference issues for adjacent band 1/n1 and shall not have impact to the incumbent deployed network. |
| Vodafone | Support the note proposed by Huawei. Also OK with the changes proposed by Ericsson in round 1. |
| TIM | TIM supports Huawei and Vodafone for the introduction of the note as reported above. |

# Recommendations for Tdocs

## 1st round

**New tdocs**

|  |  |  |
| --- | --- | --- |
| **Title** | **Source** | **Comments** |
| WF on … | YYY |  |
| LS on … | ZZZ | To: RAN\_X; Cc: RAN\_Y |
|  |  |  |

**Existing tdocs**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Tdoc number | Title | Source | Recommendation | Comments |
| R4-2107312 | On RMR 900MHz band | Huawei, HiSilicon | Noted |  |
| R4-2107313 | On RMR 1900MHz band | Huawei, HiSilicon | Noted |  |
|  |  |  |  |  |
|  |  |  |  |  |

Notes:

1. Please include the summary of recommendations for all tdocs across all sub-topics incl. existing and new tdocs.
2. For the Recommendation column please include one of the following:
   1. CRs/TPs: Agreeable, Revised, Merged, Postponed, Not Pursued
   2. Other documents: Agreeable, Revised, Noted
3. For new LS documents, please include information on To/Cc WGs in the comments column
4. Do not include hyper-links in the documents

## 2nd round

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Tdoc number** | **Title** | **Source** | **Recommendation** | **Comments** |
| R4-210xxxx | CR on … | XXX | Agreeable, Revised, Merged, Postponed, Not Pursued |  |
| R4-210xxxx | WF on … | YYY | Agreeable, Revised, Noted |  |
| R4-210xxxx | LS on … | ZZZ | Agreeable, Revised, Noted |  |
|  |  |  |  |  |

Notes:

1. Please include the summary of recommendations for all tdocs across all sub-topics.
2. For the Recommendation column please include one of the following:
   1. CRs/TPs: Agreeable, Revised, Merged, Postponed, Not Pursued
   2. Other documents: Agreeable, Revised, Noted
3. Do not include hyper-links in the documents