**3GPP TSG-RAN WG4 Meeting # 102-e R4-22XXXXX**

**Electronic Meeting, 21st February – 3rd March 2022**

**Agenda item(s): 9.4.1, 9.4.2 and 9.5.1, 9.5.2**

**Moderator: Union Inter. Chemins de Fer**

**Title:** Email discussion summary for [102-e][108] RAIL\_900\_1900MHz

**Document for:** Information

# Introduction

This e-mail discussion addresses the issues in connection with the provision of 5G NR using the assigned RMR spectrum 900MHz and 1900MHz. The discussion is addressed according to the sub-items of the planned agenda items. Table 0-1 summarizes the contributions submitted to the corresponding agenda items to be elaborated during 1st round and potentially 2nd round discussion:

Table 0-1: List of contributions applicable to thread 108

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| RMR | AI | Tdoc | Type | Title | Contributor |
| 900 | 9.4.1 | **[R4-2204551](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_102-e/Docs/R4-2204551.zip)**  | Draft TR | Version update TR\_38.853-0.3.0 | Union Inter. Chemins de Fer |
| 900 | 9.4.1 | **[R4-2205141](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_102-e/Docs/R4-2205141.zip)**  | pCR | TP 900MHz RMR band – conclusion- TR 38.853 | Union Inter. Chemins de Fer |
| 900 | 9.4.1 | **[R4-2206049](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_102-e/Docs/R4-2206049.zip)** | other | Synchronization raster design for n100 | Nokia, Nokia Shanghai Bell |
| 900 | 9.4.2 | **[R4-2204791](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_102-e/Docs/R4-2204791.zip)** | CR | 38.101-1: Introduction of 900 MHz to 5G NR for RMR | Nokia, Union Inter. Chemins de Fer |
| 1900 | 9.5.1 | **[R4-2204550](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_102-e/Docs/R4-2204550.zip)** | Draft TR | Version update TR\_38.852-0.3.0 | Union Inter. Chemins de Fer |
| 1900 | 9.5.1 | **[R4-2205140](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_102-e/Docs/R4-2205140.zip)** | pCR | TP 1900MHz RMR band – conclusion – TR 38.852 | Union Inter. Chemins de Fer |
| 1900 | 9.5.1 | **[R4-2204792](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_102-e/Docs/R4-2204792.zip)** | CR | 38.101-1: Introduction of 1900 MHz to 5G NR for RMR | Nokia, Union Inter. Chemins de Fer |

# Topic #1: RMR 900MHz

## Companies’ contributions summary – subject Revision of 3GPP TR 38.853 version 0.3.0 (study)

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2204551 | UIC | **Proposal**: The revision of 3GPP TR 38.853 v0.2.0 is for approval. Agreed TPs from RAN4#101-bis-e have been incorporated in 3GPP TR 38.853 v0.3.0. |

## Companies’ contributions summary – subject 3GPP TR 38.853 - conclusion clause (study)

| **T-doc number** | **Company** | **Proposals / Observations** |
| --- | --- | --- |
| R4-2205141 | UIC  | **Proposal 1**: The conclusion clause provides the necessary outline of the work and the recommendation to transfer the findings to the corresponding normative technical specifications.  |

## Companies’ contributions summary – others in 3GPP TR 38.853 sync raster consideration to support CBW<5MHz in band n100 (study)

| **T-doc number** | **Company** | **Proposals / Observations** |
| --- | --- | --- |
| R4-2206049 | Nokia | **Observation 1:** In general, for an allowed bandwidth of, for example, 3 MHz, and with the principle of not modifying PSS and SSS, the clusters of synchronization raster points need to be separated less than 1.2 MHz in order to have at least one valid synchronization raster point for each 3 MHz channel if 100 kHz channel raster is applied. **Observation 2**: A new design would be needed for sync raster for n100 in order to support narrowband NR allocation in both ends of the band.**Proposal 1:** New sync raster design is needed for n100 in order to support narrowband NR allocation. Consider 100 kHz sync raster for n100 where:NREF = 184140:20:184740;SSREF= 5 kHz x NREF;

|  |  |  |  |
| --- | --- | --- | --- |
| NR *operating band* | SS Block SCS | SS Block pattern(NOTE 1) | Range of GSCN(First – <Step size> – Last) |

|  |  |  |  |
| --- | --- | --- | --- |
| n100 | 15 kHz | Case A | (Note 9) |
| NOTE 1: SS Block pattern is defined in clause 4.1 in TS 38.213 [10].NOTE 2: The applicable SS raster entries are GSCN = {6432, 6443, 6457, 6468, 6479, 6493, 6507, 6518, 6532, 6543}NOTE 3: The applicable SS raster entries are GSCN = {5032, 5043, 5054}NOTE 4: The applicable SS raster entries are GSCN = {4707, 4715, 4718, 4729, 4732, 4743, 4747, 4754, 4761, 4768, 4772, 4782, 4786, 4793}NOTE 5: The following GSCN are allowed for operation in band n46: GSCN = {8996, 9010, 9024, 9038, 9051, 9065, 9079, 9093, 9107, 9121, 9218, 9232, 9246, 9260, 9274, 9288, 9301, 9315, 9329, 9343, 9357, 9371, 9385, 9402, 9416, 9430, 9444, 9458, 9472, 9485, 9499, 9513}.NOTE 6: The following GSCN are allowed for operation in band n96: GSCN = { 9548, 9562, 9576, 9590, 9603, 9617, 9631, 9645, 9659, 9673, 9687, 9701, 9714, 9728, 9742, 9756, 9770, 9784, 9798, 9812, 9826, 9840, 9853, 9867, 9881, 9895, 9909, 9923, 9937, 9951, 9964, 9978, 9992, 10006, 10020, 10034, 10048, 10062, 10076, 10090, 10103, 10117, 10131, 10145, 10159, 10173, 10187, 10201, 10214, 10228, 10242, 10256, 10270, 10284, 10298, 10312, 10325, 10339, 10353}.NOTE 7: The SS raster entries apply for channel bandwidths larger than or equal to 40 MHz.NOTE 8: The SS raster entries apply for channel bandwidths smaller than 40 MHz.NOTE 9:   For n100 the absolute synchronization raster frequency points are 5 kHz \* NREF, with NREF equal to 184140:20:184740 |

Others: **Observation 3:** A new sync raster design is likely needed also for bands n8, n26 and n28 in order to support for instance dedicated spectrum use of 3 MHz NR operation for instance for smart grid and public safety. **Observation 4:** 100 kHz sync raster can be considered for n8, n26 and n28 to support dedicated spectrum use of narrowband NR (e.g. 3 MHz NR operation).  |

## Companies’ contributions summary – 3GPP TS 38.101-1 Introduction of 900MHz to 5G NR for RMR (n100) (normative)

| **T-doc number** | **Company** | **Proposals / Observations** |
| --- | --- | --- |
| R4-2204791 | Nokia | **General proposal:** Agree on CR1010 3GPP TS 38.101-1: Introduction of 900 MHz to 5G NR for RMR  |

## Open issues summary

### Sub-topic 1-1 revision 3GPP TR 38.853 v0.3.0

**Issue 1-1**: The proposed revision of 3GPP TR 38.853 v0.3.0 is for approval based on RAN4#101-bis-e technical proposals. Please indicate concerns if something is missing.

Please provide comments if necessary.

Proposal(s)

* Option 1: Approve R4-2204551
* Option 2: N/A
* Recommended WF
	+ Approve TR 38.853 v0.3.0

### Sub-topic 1-2 subject 3GPP TR 38.853 - conclusion clause

**Issue 1-1**: The contribution addresses the conclusions based on the elaborated 5G NR system parameter related to RMR900, BS RF parameter and UE RF parameter. The present tdoc provides the summary and the recommendation to transpose the agreed necessary parameter applicable for RMR900 to normative. Please provide relevant comments and indicate if something is missing.

Proposal(s)

* Option 1: Approve R4-2205141
* Option 2: N/A

### Sub-topic 1-3 others in 3GPP TR 38.853 sync raster consideration to support CBW<5MHz in band n100

**Issue 1-1**: The tdoc proposes to revisit the sync raster design applicable for band n100 to support CBW smaller 5MHz. Current sync raster considers raster position every 1.2MHz. The current approach using 1.2MHz raster position will limit the placement of CBW i.e. 3MHz keeping the principle that PSS and SSS are not modified. The contribution scrutinises potential sync raster re-design options for the use of 3MHz CBW.

Proposal(s)

* Option 1: Follow the proposal of R4-2206049 and agree on the proposed changes.
* Option 2: Other

Proposed WF: Determine the necessary options to allow certain flexibility in the use of 3Mhz CBW considering the proposed sync raster options.

### Sub-topic 1-4 3GPP TS 38.101-1 Introduction of 900MHz to 5G NR for RMR (n100)

**Issue 1-1**: The CR addresses the necessary UE RF changes to enable the use of RMR900 spectrum under band n100.

Proposal(s)

* Option 1: Follow the proposal of R4-2204791 and agree CR 1010.
* Option 2: NA

WF: The CR 1010 just considers the parameters approved during the study. Please agree CR1010.

## Companies views’ collection for 1st round

### Open issues

**Sub-topic 1-1 Revision of 3GPP TR 38.853 v0.3.0**

|  |  |
| --- | --- |
| Company | Comments |
| Nokia | Option 1: Approve R4-2204551 |
| Ericsson | Agree |
| Moderator | The proposed revision of 3GPP TR 38.853 is agreed. The sub-topic can be closed. |
|  |  |

**Sub-topic 1-2 3GPP TR 38.853 - conclusion clause**

|  |  |
| --- | --- |
| Company | Comments |
| Nokia | Option 1: Approve R4-2205141 |
| Ericsson | Agree |
| Huawei | There is a typo in the last paragraph. Power Class 3 UEs were considered not PC1. |
| Moderator | Revision need to be provided. |

**Sub-topic 1-3 others in 3GPP TR 38.853 sync raster consideration to support CBW<5MHz in band n100**

|  |  |
| --- | --- |
| Company | Comments |
| Nokia | Option 1: Follow the proposal of R4-2206049 and agree on the proposed changes. |
| UIC | UIC supports the sync raster redesign proposal using 100kHz sync raster to achieve certain flexibility in the placement of the 3MHz CBW in the corresponding spectrum block. Nevertheless it need to be clarified in the corresponding study as well as in the CR, that band n100 can be either operated in 5MHz CBW mode or in 3MHz CBW mode. For 5MHz CBW the sync raster clustering of 1.2Mhz applies and for 3MHz CBW the sync raster clustering of 100kHz applies?The subject area need to be recorded in the corresponding TR 38.853 clause elaborating on system parameters. |
| Ericsson | It’s too early to introduce such update, we need to wait for the first outcomes of the new Rel-18 WI. As stated in R4-220649, there are several options,they need further analysis before any conclusion could be made. Also, other bands targeted with this new WI would also be impacted, updates should be preferrably aligned. Such proposal is premature. |
| Huawei | We echo the comment by Ericsson. It is prudent to wait and align with the approach for other bands. |
| Nokia | To Ericsson and Huawei, we do not agree. If we do not adopt 100 kHz sync raster already now, it remains obvious that a change is needed in rel-18. Rel-17 specification will not be meaningful for practical operations in the field and overall the UE complexity will increase with different solutions in different releases. Therefore, 100 kHz raster should be adopted for n100 now. Other bands can be covered in rel-18 as they already have existing designs. |
| UIC | Apart from the Rel-17/Rel-18 timeline, GSM-R is still used in Europe. For this purpose, the 876-880/921-925MHz spectrum range, which cannot be cleared overnight, is used in order to then operate band n100 with a CBW of 5 MHz and GSM-R at the same time. This approach is not feasible because tens of thousands of locomotives or train compositions would have to be converted in one night. Band n100 is special compared to the other bands listed in R4-2206049 because the lower band limit of 919.4MHz does not provide an integer value. The contribution R4-2206049 looks at the effects of the current sync grid, which is initially examined separately from the other bands. Accordingly, suggestions are made as to how the spectrum could most effectively be operated simultaneously by broadband and narrowband (GSM-R) and how this can be dealt with. The issue should therefore be addressed openly now. |
| Moderator | Apart the Rel-17 and Rel-18 timeline, companies are encouraged to discuss the necessary means to enable the use of band n100 for a channel bandwidth <5Mhz. The proposal made in R4-2206049 addresses a fundamental subject area necessary to allow operation of CBW<5MHz. Second round shall consider the necessary basics for sync raster redesign applicable for band n100. |

**Sub-topic 1-4 3GPP TS 38.101-1 Introduction of 900MHz to 5G NR for RMR (n100)**

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| --- | --- |
| Company | Comments |
| Nokia | CR needs update if subtopic 1-3 is agreed and support CBW<5MHz is added |
| UIC | If sync raster redesign proposal applicable for band n100 will be agreed, the corresponding CR need to be revised accordingly. |
| Ericsson | Agree, we don’t agree updating with the sync raster while the new Rel-18 is even started. |
| Huawei | Agree with Ericsson |
| Nokia | See comment above in sub-topic 1-3 |
| Moderator | Depending on the outcome in of sub-topic 1-3 during the second round, the CR content may require further revisions. |

## Summary for 1st round

### General

### Open issues

|  |  |
| --- | --- |
|  | Status summary  |
| Sub-topic 1-2 | Revision of R4-2205141 to revise the typo. |
| Sub-topic 1-3 | Second round shall focus on the elementary aspects to enable an optimal use of the spectrum in band n100 using CBW<5MHz. The necessary sync raster redesign should be discussed in depth accordingly. |
| Sub-topic 1-4 | Depends on the outcome of sub-topic 1-3 discussion during second round. |

### CRs/TPs

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| --- | --- |
| CR/TP number | CRs/TPs Status update recommendation  |
| 1010 | Requires approval during second round. Potentially revisions are necessary. |
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## Discussion on 2nd round (if applicable)

# Topic #2: RMR 1900

## Companies’ contributions summary – subject Revision of 3GPP TR 38.852 version 0.3.0 (study)

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| --- | --- | --- |
| T-doc number | Company | Proposals / Observations |
| R4-2201682 | UIC | **Proposal**: The revision of 3GPP TR 38.852 v0.2.0 is for approval. Agreed TPs from RAN4#101-bis-e have been incorporated in 3GPP TR 38.852 v0.3.0.. |

## Companies’ contributions summary – subject 3GPP TR 38.852 – conclusion clause (study)

|  |  |  |
| --- | --- | --- |
| T-doc number | Company | Proposals / Observations |
| R4-2205140 | UIC | **Proposal 1**: The conclusion clause provides the necessary outline of the work and the recommendation to transfer the findings to the corresponding normative technical specifications. |

## Companies’ contributions summary – 3GPP TS 38.101-1 Introduction of 1900MHz to 5G NR for RMR (n101) (normative)

|  |  |  |
| --- | --- | --- |
| T-doc number | Company | Proposals / Observations |
| R4-2204792 | Nokia | **General proposal:** Agree on CR1011 3GPP TS 38.101-1: Introduction of 1900 MHz to 5G NR for RMR |

## Open issues summary

### Sub-topic 2-1 revision 3GPP TR 38.852 v0.3.0

**Issue 1-1**: The proposed revision of 3GPP TR 38.852 v0.3.0 is for approval based on RAN4#101-bis- e technical proposals. Please indicate concerns if something is missing.

Proposal(s)

* Option 1: Approve R4-2204550;
* Option 2: N/A
* Recommended WF
	+ Approve TR 38.853 v0.3.0

### Sub-topic 2-2 – subject 3GPP TR 38.852 - conclusion clause

**Issue 1-1**: The contribution addresses the conclusions based on the elaborated 5G NR system parameter related to RMR1900, BS RF parameter and UE RF parameter. The present tdoc provides the summary and the recommendation to transpose the agreed necessary parameter applicable for RMR1900 to normative. Please provide relevant comments and indicate if something is missing.

Proposal(s)

* Option 1: Approve R4-2205140
* Option 2: NA

### Sub-topic 2-3 3GPP TS 38.101-1 Introduction of 1900MHz to 5G NR for RMR (n101)

**Issue 1-1**: The CR addresses the necessary UE RF changes to enable the use of RMR1900 spectrum under band n100.

Proposal(s)

* Option 1:Follow the proposal of R4-2204792 an agree CR 1011;
* Option 2: NA

WF: The CR 1011 just considers the parameters approved during the study. Please agree CR1011.

## Companies views’ collection for 1st round

### Open issues

**Sub-topic 2-1 3GPP TR 38.852 revision version 0.3.0**

|  |  |
| --- | --- |
| Company | Comments |
| Nokia | Option 1: Approve R4-2204550 |
| Ericsson | Agree |
| Huawei |  |
| Moderator | The proposed revision of 3GPP TR 38.853 is agreed. The sub-topic can be closed. |
|  |  |

**Sub-topic 2-2 subject 3GPP TR 38.852 - conclusion clause**

|  |  |
| --- | --- |
| Company | Comments |
| Nokia | Option 1: Approve R4-2205140 |
| Ericsson | Agree |
| Huawei | There is a typo in the last paragraph. Power Class 3 UEs were considered not PC1. |
| Moderator | Revision need to be provided. |
|  |  |

**Sub-topic 2-3 3GPP TS 38.101-1 Introduction of 1900MHz to 5G NR for RMR (n101)**

|  |  |
| --- | --- |
| Company | Comments |
| Nokia | Option 1:Follow the proposal of R4-2204792 an agree CR 1011 |
| UIC | Option 1: Agree on CR 1011 - 3GPP TS 38.101-1. |
| Ericsson | Agree |
| Huawei | Option 1. We would like to mention a point regarding the DraftCR(R4-2204792) corresponding to this CR. Although the DraftCR and the CR are similar or n101 specifications, but the DraftCR miss many other parameters for other bands. For example in Table 5.3.5-1 for n40, CBW=70MHz is missing for SCS 30KHz and 60KHz. Another example could be the absence of Refsens values of n85 from Table 7.3.2-1a.These inconsistencies should be related to the fact that the latest data of TS 38.101-1 was not considered. So please make sure other CRs are based on thelatest versions. |
| Nokia | Latest specification version was used for this CR. |
| Moderator | Apart that potentially the last version of the corresponding 3GPP TS was used, the comment provided by Huawei addresses missing information/parameters related to other bands but not to band n101. The CR addresses the band n101 and the corresponding change bars. The CR is approved and the sub-topic can be closed. |

## Summary for 1st round

### General

### Open issues

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| --- | --- |
|  | Status summary  |
| Sub-topic 1-2 | Revision of R4-2205141 to revise the typo. |
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|  |  |

### CRs/TPs

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| --- | --- |
| CR/TP number | CRs/TPs Status update recommendation  |
| 1011 | The CR is approved. |
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## Discussion on 2nd round (if applicable)

*Moderator can provide summary of 2nd round here. Note that recommended decisions on tdocs should be provided in the section titled ”Recommendations for Tdocs”.*

# Recommendations for Tdocs

## 1st round

**New tdocs**

|  |  |  |
| --- | --- | --- |
| Title | Source | Comments |
| * WF on sync raster redesign to enable operation of CBW<5MHz
 | Moderator (UIC) |  |
|  |  |  |
|  |  |  |

**Existing tdocs**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Tdoc number | Title | Source | Recommendation  | Comments |
| R4-2204551 | Version update TR\_38.853-0.3.0 | Union Inter. Chemins de Fer |  |  |
| R4-2205141 | TP 900MHz RMR band – conclusion- TR 38.853 | Union Inter. Chemins de Fer |  |  |
| R4-2206049 | Synchronization raster design for n100 | Nokia, Nokia Shanghai Bell |  |  |
| R4-2204791 | 38.101-1: Introduction of 900 MHz to 5G NR for RMR | Nokia, Union Inter. Chemins de Fer |  |  |
| R4-2204550 | Version update TR\_38.852-0.3.0 | Union Inter. Chemins de Fer |  |  |
| R4-2205140 | TP 1900MHz RMR band – conclusion – TR 38.852 | Union Inter. Chemins de Fer |  |  |
| R4-2204792 | 38.101-1: Introduction of 1900 MHz to 5G NR for RMR | Nokia, Union Inter. Chemins de Fer |  |  |
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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

# Annex

Contact information

|  |  |  |
| --- | --- | --- |
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