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

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

**Agenda item:** 5.3.4, 8.11.4

**Source:** Moderator (ZTE Corporation)

**Title:** Email discussion summary for [98-bis-e] [302] NR\_EMC

**Document for:** Information

# Introduction

For the RAN4 [98-bis-e] [302] NR\_EMC, the main topics are about IAB EMC and NR repeaters EMC including agenda items 5.3.4 and 11.11.4. Therefore, the discussions will separate into two parts:

Topic #1: Agenda item 5.3.4: IAB EMC

Topic #2: Agenda item 8.11.4: NR Repeaters EMC

# Topic #1: IAB EMC

*Main technical topic overview. The structure can be done based on sub-agenda basis.*

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2104960**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2104960.zip) | ZTE Corporation | **Proposal 1:** The spatial exclusion zone is only applicable to the IAB type 1-O or type 2-O with one antenna array plane. If an IAB type 1-O or type 2-O has two antenna arrays in two directions, it is recommended that the exclusion band be expanded instead of two spatial exclusion zones. |
| [**R4-2106510**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2106510.zip) | Ericsson | ***Observation 1****: IEC 61000-6-1 indicates that the performance level to evaluate the impact of transient phenomena is specified by the manufacturer.*  ***Observation 2:*** *The performance level may be replaced by a permissible loss of performance. If the minimum performance level or permissible performance loss is not specified by the manufacturer, either of these may be derived from the product description and documentation and what the user reasonably expect from the apparatus if used as intended.*  ***Observation 3:*** *The approach followed by ETSI and 3GPP in the MSR standard for evaluating transient phenomena is aligned with IEC definition for performance criteria. This criterion should be followed when defining the Performance Criteria for Transient Phenomena for IAB.*  ***Observation 4:*** *It might be necessary to update EMC NR specification to align performance criteria for transient phenomena both with MSR/ETSI standard and the points refereed by IEC.*  Based on these elements we propose:  ***Proposal 1: To agree on the companion Draft CR to TS 38.175 [2] defining performance criteria for IAB.*** |
| [**R4-2106511**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2106511.zip) | Ericsson, ZTE | <Based on [**R4-2106510**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2106512.zip)>  Draft CR to TS 38.175 on IAB EMC test configurations and performance requirements  **Reason for change:** Introduction of test configurations and performance requirements in IAB EMC specification is required to complete the EMC IAB standard.  **Summary of change:** Introduction of test configurations and performance requirements in IAB EMC specification TS 38.175. |
| [**R4-2106512**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2106512.zip) | Ericsson | Observation 1: Considering the statement of IEC in [1], it is possible (when technically justified) to test the EUT by exposing fewer faces to the generating antenna.  Observation 2: Protection of the EUT should be part of the considerations when defining EMC RI requirements. In that sense, IAB node should be also protected as NR BS with the definition of spatial exclusion.  Observation 3: The implementation of spatial exclusion should be considered to protect the antenna array elements irrespective of the IAB node implementation.  Observation 4: Excluding sides of the IAB node during the RI test does not imply a relaxation on the testing or the requirements, since there are additional mechanisms to guarantee the performance of the EUT fits within regulatory requirements while protecting other services.  Observation 5: Antenna array is the key element to be protected during the Radiated Immunity test. Although there might be differences in the architecture setup/IAB implementation, IAB EMC standard shall secure both the fulfillment of the EMC requirements and the protection of the EUT.  Observation 6: IAB EMC specification should offer a basic guidance on how the testing procedure shall be carried out, setting the basic requirements for the testing, but without going on specific architecture considerations. Therefore, it would be enough to state that antenna array(s)/radiating elements shall be excluded/protected during RI testing.  Based on these elements we propose:  **Proposal 1:** To include the spatial exclusion concept under the Radiated Immunity considerations for EMC IAB specification TS 38.175.  **Proposal 2:** To agree on the companion Draft CR to TS 38.175 [4] adding spatial exclusion to Radiated Immunity testing. |
| [**R4-2106513**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2106513.zip) | Ericsson | <Based on [**R4-2106512**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2106512.zip)>  **Reason for change:** Introduction of spatial exclusion concept for IAB EMC CR to TS 38.175 on Spatial Exclusion for IAB EMC Radiated Immunity test.  **Summary of change:** Introduction of spatial exclusion concept for IAB EMC CR to TS 38.175 on Spatial Exclusion for IAB EMC Radiated Immunity test. |

## Open issues summary

*In last meeting, spatial exclusion for IAB EMC RI testing were discussed, However, no consensus were achieved, where one company think there existed some challenges while other companies think current NR BS methods can be reused. In the end, a WF (R4-2103773) incorporated some agreements on the IAB EMC RI testing with spatial exclusion was agreed.*

*Table 4.4.1-1: ΔfRX offset values for IAB (cited form TS38.175)*

|  |  |  |  |
| --- | --- | --- | --- |
| *IAB type* | *IAB operating band characteristics* | *RI test setup* | *ΔfRX (MHz)* |
| *IAB type 1-O* | *FUL,high – FUL,low < 100 MHz* | *With exclusion zone* | *[20]* |
|  |  | *Without exclusion zone* | *[60]* |
|  | *100 MHz ≤ FUL,high – FUL,low ≤ 900 MHz* | *With exclusion zone* | *[60]* |
|  |  | *Without exclusion zone* | *[200]* |

### Sub-topic 1-1

**Issue 1-1: Whether or not the current values of spatial exclusion zone of NR BS can be reused in the IAB RI testing (i.e. ΔfRX )?**

* Proposals
  + Tentative agreements: Yes (R4-2106512, R4-2106513, R4-2104960)
* Recommended WF
  + TBA

**Issue 1-2: How to address the “spatial exclusion”?**

* Proposals
  + Option 1:
    - Proposal:The spatial exclusion zone is only applicable to the IAB type 1-O or type 2-O with one antenna array plane. If an IAB type 1-O or type 2-O has two antenna arrays in two directions, it is recommended that the exclusion band be expanded instead of two spatial exclusion zones.
  + Option 2: TBA
* Recommended WF
  + TBA

**Issue 1-3: How to define the Performance Criteria for Transient Phenomena for IAB?**

* Proposals
  + Option 1: aligned with IEC definition
  + Option 2: Others
* Recommended WF
  + TBA

## Companies views’ collection for 1st round

### Open issues

*One of the two formats, i.e. either example 1 or 2 can be used by moderators.*

**Example 1**

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Huawei | Issue 1-1: It seems that the exclusion band (ΔfRX) is confused with the spatial exclusion concept for conformance testing. - most of the topics raised (e.g. synchronization, synchronization, RF architecture, types of repeaters, etc.) are seen as not really impacting the core EMC requirements. Those topics are considered to be transparent from the EMC point of view. Still, considering the timeline of the WI, we are fine to wait for more discussion in RF room. not the “spatial exclusion”. This needs to be clarified. For the ΔfRX exclusion band values: we agree with the tentative agreement, the [] can be removed. The [] were to be kept until the discussion on the related spatial exclusion is concluded. The ΔfRX values were not questioned so far by any company.  Issue 1-2: Option 2  It is OK to consider various IAB implementations during the technical analyses, but for the specification text we need to look for general wording in order not to limit any implementations. We have already agreed in the past that the spatial exclusion concept shall be used for IAB. In our view, now we need to look into the following topics:   * Work on the wording for the spatial exclusion * Discuss if the LS to IEC is necessary to inform them that the EMC RI testing may not be doable for some IAB implementations (e.g. 3-panel).   Despite of this, we have concerns on the concept of IAB with one array (how such solution is supposed to improve coverage and maintain two radio links?) or with two arrays (this looks like relay/repeater – IAB is much more advanced and is supposed to find donor, configure backhaul etc.).  Issue 1-3: it needs to be clarified that the legacy EMC specifications text is aligned with IEC specs already. If we are going to work on Ericsson’s proposal (we have no strong arguments against it) there are some implementation issues which need to be clarified. Maybe proponents can provide more clarifications to progress on this topic:   * Why Performance Criteria for Transient Phenomena is proposed to be different than for Continuous Phenomena (as it is right now in ETSI spec)? * For the legacy specifications, we would prefer not to delete the existing text on the performance criteria – we can add/align some extra wording with the ETSI approach instead. * We prefer to have aligned approach among all EMC specs. The proposal approach introduces mis-alignment among specs. * The proposed solution refers to the manufacturer declarations. Please note that for AAS BS and NR BS, there is explicit list of manufacturer declarations in the RF conformance specifications. It is not clear how to solve this for EMC specs. |
| Ericsson | Issue 1-1 and 1-2: Exclusion bands are used as a mechanism to protect the EUT during the RI test. One of the points that we proposed in a previous meeting was to re-use the values defined for the BS when it is not possible to apply the spatial exclusion. So, in this regard, the values are ok.  Regarding the spatial exclusion, both Huawei and ZTE have highlighted the impact of IAB architecture design in the use of spatial exclusion during RI testing. We all agree in the need to protect the antenna arrays during immunity testing. Our proposal, which can be adjusted according to the outcome of this discussion, is to avoid the application of the interferer over any radiating element of the IAB node. Then, and this is our understanding, we can avoid going deep in the description of different architecture/design implementations.  There might be necessary to include a consideration for those scenarios that might lead to No testing any of the IAB faces. Perhaps, in this specific situation the alternative can be to rely on the exclusion bands.  Issue 1-3: Of the several EMC immunity tests, some are continuous, and others are transient. The first ones are usually modulated and applied to the EUT over a period of time. The transient ones are very short bursts and may have come and gone in a matter of microseconds. It is due to this fast behavior that ETSI aims at simplifying the measurement of EUT’s performance. In the transient phenomena the idea is to monitor during a longer period of time the performance of the EUT.  MSR standard follows the “simplified approach”, and includes NR technology in its scope, while the AAS one relies on the corresponding EMC RAT to set the criteria. So, we could say there is already a misalignment in the spec. Better to align IAB, MSR, NR and AAS in this case. The manufacturer declaration is also used in the MSR spec with no problem, then we don’t see this as a direct obstacle. Unless, we need to wait for it from the IAB RF discussion. |

### CRs/TPs comments collection

*For close-to-finalize WIs and maintenance work, comments collections can be arranged for TPs and CRs. For ongoing WIs, suggest to focus on open issues discussion on 1st round.*

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| [**R4-2106511**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2106511.zip) | Huawei: see comments in issue 1-3.  - What is the motivation to have FRC based criteria for continuous phenomena, while for the transient phenomena only general statements?  - Whichever way we go: we would prefer to have aligned approach across all EMC specs (probably this would fit the EMC umbrella WI, actually). Otherwise, focus only on the IAB spec for now.  - "total test" wording copied from the ETSI spec does not seem to be clear. |
| Ericsson: See comments in issue 1-3 |
|  |
| [**R4-2106513**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2106513.zip) | Huawei:  - don’t agree. This does not consider IAB specifics. Leaving the IAB spec with such content would not guide the reader on the way IAB shall be tested for the EMC RI. There is no RAN4 conclusion captured on the usefullness (or lack of it) of the spatial exclusion for the IAB.  - trying to apply the proposed text to the typical 360deg 3-panel IAB implementation would lead to NO test for EMC RI. This needs to be resolved.  - Figure is not representative of IAB. Remove or revise.  - We recommend to further continue technical discussion on this topic.  Additional comments based on related discussion paper:  - O4 from R4-2106512: what if all sides would have to be excluded? Does it mean that RAN4 spec would allow not to test EMC RI, or spatial exclusion would have to be excluded from the test procedure? As ETSI did not included the spatial exclusion in their EMC specification, we may need to rely on the exclusion bands only for the purpose of EMC RI testing. Clearly, more discussion is needed.  - O6 from R4-2106512: this is not provided in the proposed draftCR. |
| Ericsson: See comments in issue 1-1 and 1-2 |
|  |

## 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.*

|  |  |
| --- | --- |
|  | **Status summary** |
| **Sub-topic #1** | *Tentative agreements:*  *Candidate options:*  *Recommendations for 2nd round:* |

### CRs/TPs

*Moderator tries to summarize discussion status for 1st round and provides recommendation on CRs/TPs Status update*

*Note: The tdoc decisions shall be provided in Section 3 and this table is optional in case moderators would like to provide additional information.*

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation** |
| XXX | *Based on 1st round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

## Discussion on 2nd round (if applicable)

# Topic #2: NR Repeaters EMC

*Main technical topic overview. The structure can be done based on sub-agenda basis.*

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2104961**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2104961.zip) | ZTE Corporation | Skeleton TS 38.114 |
| [**R4-2106514**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2106514.zip) | Ericsson | **Proposal 1:** To rely on CISPR/IEC and ETSI recommendations to define the NR RF Repeaters EMC requirements.  **Proposal 2:** Discuss the changes and additions needed to cover EMC NR Repeaters in coordination with RF section. |
| [**R4-2107252**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2107252.zip) | Nokia, Nokia Shanghai Bell | 1. Option 2: It is premature to decide, pending on the repeater RF discussion, more discussions are needed for TDD NR repeaters. 2. For FDD NR repeaters, TS 36.113 and TS 38.113 can act as a starting point. |

## Open issues summary

*A new TS (TS38.114) is agreed for NR Repeaters EMC according to the revised WID for NR repeaters (RP-210818).*

### Sub-topic 2-1

*Sub-topic description:*

*Open issues and candidate options before e-meeting:*

**Issue 2-1: NR Repeaters EMC TS (i.e. TS38.114) skeleton**

* Proposals
  + Tentative agreements: Agree on the skeleton in [R4-2104961](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2104961.zip).
* Recommended WF
  + TBA

### Sub-topic 2-2

*As the discussion on repeaters RF core requirement are underway, also the some EMC requirements are pending on the outcomes of the RF discussion.*

**Issue 2-2-1: Whether or not the following EMC requirements are referred to CISPR or IEC specifications and can be applied to NR FDD/TDD repeaters?**

* + Radiated emission(ancillary equipment), conducted emission (including DC power input/output port, AC mains power input/output port, Telecommunication port) , Harmonic current emissions(AC mains input port), Voltage fluctuations and flicker (AC mains input port)
  + RF electromagnetic field (80 MHz to 6000 MHz), conducted immunity (0.15 MHz - 80 MHz), ESD, EFT, Voltage dips, surges
* Proposals
  + Tentative agreements: Yes
* Recommended WF
  + TBA

**Issue 2-2-2: Other than the requirements mentioned in issue 2-2-1, how to define the other requirements (such as radiated emission requirement) for NR TDD repeaters?**

* Proposals
  + Option 1: Pending on the repeater RF discussion, more discussions are needed for TDD NR repeaters.
  + Option 2: TBA
* Recommended WF
  + TBA

**Issue 2-2-3: Other than the requirements mentioned in issue 2-2-1, how to define the other requirements (such as radiated emission requirement) for NR FDD repeaters?**

* Proposals
  + Tentative agreements: TS 36.113 and TS 38.113 can act as a starting point
* Recommended WF
  + TBA

## Companies views’ collection for 1st round

### Open issues

Sub topic 2-1

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Huawei | Issue 2-1: we have not concluded technical analysis of the EMC requirements for NR repeater (whether or not those could be reused from 36.113/38.113).  We are not going to work on TPs until the technical analysis on EMC requirements is concluded in RAN4, first. Therefore we prefer not to spent time on the new EMC spec skeleton at this stage. |
| Nokia, Nokia Shanghai Bell | Issue 2-1: At the moment, priority should be given to specification work of EMC core requirements. There are still many open issues surrounding NR repeaters, in particular, TDD. |
| Ericsson | Before agreeing in the skeleton proposed, it is better to align RAN4 internal position regarding EMC NR Repeater. Our main position is that most of the requirements can be reused from BS spec. How this is going to be implemented needs to be agreed. |

Sub topic 2-2

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Huawei | Issue 2-2-1: those requirements are referred from CISPR and IEC specifications in all other EMC specifications, i.e. there is nothing specific for NR repeater. If all those requirements are referred from external specs, it is even more questionable why we need to introduce new EMC spec for NR repeater.  It shall be clarified that we discuss only core requirements here. For the conformance, there are test configurations aspects which require RAN4 specific inputs (to complement inputs from IEC/CISPR).  Issue 2-2-2: agree to continue technical analysis for TDD aspects.  We would like to raise one question here: is it expected that there will be any difference in the core requirement for the TDD and FDD operation? In our view, the difference is expected in the conformance requirements the related test configurations. We would like to know feedback from other companies on this issue.  Issue 2-2-3: ok - this is seen as common understanding already from the previous meeting.  We would like to raise one question here: is it expected that there will be any difference in the core requirement for the TDD and FDD operation? In our view, the difference is expected in the conformance requirements the related test configurations. We would like to know feedback from other companies on this issue.  Additional comments to R4-2106514:  - O2: agree on the observation that Conducted emission test methods and levels defined by IEC/CISPR are independent of the IAB characteristics, including the operating frequency or RAT.  - O3: as the NR repeater will cover FR2, we shall rather inform IEC (and ETSI) on the RAN4 developments on NR repeaters to keep relevant technical bodies informed (we did sent LS to IEC back in 2018 during NR Rel-15 work, but no feedback was received). This is especially important as RAN4 relied on external IEC specifications.  - O4: agree.  - O5: this is not very detailed, but we have provided initial analysis last meeting showing the same conclusion.  - O6: ok to postpone decision and to follow RF discussions.  - P1: this is considered as common understanding. Still, not sure if we need to have formal agreement on this as it is very general - more details needed (per look per requirement).  - P2: we shall rather follow discussion in RF - coordination was never working in the past. Offline/internal coordination is ok though.  Additional comments to R4-2107252:  - Most of the topics raised (e.g. synchronization, synchronization, RF architecture, types of repeaters, etc.) are seen as not really impacting the core EMC requirements. Those topics are considered to be transparent from the EMC point of view. Still, considering the timeline of the WI, we are fine to wait for more discussion in RF room. |
| Nokia, Nokia Shanghai Bell | Issue 2-2-1: It is recommended to separate FDD and TDD NR repeaters in the discussions. It is not clear if the core requirements are the same for both FDD and TDD NR repeaters. CISPR or IEC can be used as baseline.  Issue 2-2-2: At the moment, it is too early to reach conclusions on whether core requirements for TDD repeaters are the same as FDD or not. There are open issues which are common to both EMC and RF. It is recommended to further discuss and take into consideration progress made in RF discussions.  Issue 2-2-3: The proposal is fine for FDD repeaters. For NR TDD repeaters, refer to the comment for Issue 2-2-2. |
| Ericsson | Issue 2.2-1 Reusing requirements from CISPR and IEC is the common ground for EMC discussion. In terms of performance criteria, the values are also independent of what RF discussion might decide. We need RF input in aspects such as the Test Configurations and radiated emission levels.  Issue 2.2-1 Agree with option 1. So far, we do not have technical elements that allow us to determine differences in the operation and any impact on the testing.  Issue 2.2.3 BS specs can be a good starting point. Informing LS could be an alternative once the discussion in RAN 4 is mature enough from a technical point of view. |

### CRs/TPs comments collection

*Major close to finalize WIs and Rel-15 maintenance, comments collections can be arranged for TPs and CRs. For Rel-16 on-going WIs, suggest to focus on open issues discussion on 1st round.*

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| XXX | Company A |
| Company B |
|  |
| YYY | Company A |
| Company B |
|  |

## 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.*

|  |  |
| --- | --- |
|  | **Status summary** |
| **Sub-topic#1** | *Tentative agreements:*  *Candidate options:*  *Recommendations for 2nd round:* |

### CRs/TPs

*Moderator tries to summarize discussion status for 1st round and provided recommendation on CRs/TPs Status update suggestion*

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation** |
| XXX | *Based on 1st round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

## 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 … | YYY |  |
| LS on … | ZZZ | To: RAN\_X; Cc: RAN\_Y |
|  |  |  |

**Existing tdocs**

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

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