**3GPP TSG-RAN WG4 Meeting # 99-e R4-210XXXX**

**Electronic Meeting, 19th – 28th May, 2021**

**Agenda item:** 4.1.2

**Source:** Hisashi Onozawa (Nokia)

**Title:** Email discussion summary for [99-e][102] NR\_NewRAT\_UE\_RF\_R15

**Document for:** Information

# Introduction

Rel-15 UE RF requirement maintenance is discussed in this thread.

* Topic #1: RAN5 LS reply
  + Sub-topic 1-1: Ambiguity in deciding TL,C
* Topic #2: CA/DC NS
* Topic #3: Maintenance of TS 38.101-1 and TS 38.307
  + Sub-topic 3-1 FR1 UL MIMO EVM
  + Maintenance CRs to TS 38.101-1
  + Maintenance CRs to TS 38.307
* Topic #4: TS 38.101-2 maintenance
  + Sub-topic 4-1: EESS protection
  + Sub-topic 4-2: RF requirement applicability under ETC (FR2)
  + Maintenance CRs to TS 38.101-2
* Topic #5: intra/inter-band Contiguous/Non-Contiguous MRDC
* Topic #6: TS 38.101-3 maintenance
  + Sub-topic 6-1: CIM
  + Maintenance CRs to TS 38.101-3

Agenda changes:

R4-2110982 🡨 AI 5.1.7.2 [#103]

R4-2111353 🡨 AI5.3 [#105]

R4-2110186/0187/0188/0189/0190/0191 🡪 5.1.7.2 [103]

R4-2110805 🡪 13.2 [#159]

R4-2110806, R4-2110396 🡪 13.2 [#160]

R4-2110932/0933/0934 🡪 13.2 [#134]

# Topic #1: RAN5 LS reply

LS reply to the following LS from RAN5 is handled in Topic#1.

* R4-2100020 (R5-206676) LS on ambiguity in deciding TL,C

## Companies’ contributions summary

LS reply

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2108926**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2108926.zip) | Nokia, Nokia Shanghai Bell | LS to RAN5 that confirms that ∆Tc should not be double counted and fix errors by removing ∆TC,c from relevant PCMAX\_L,f,c formulas such as  PCMAX\_L,f,c = MIN {PEMAX,c– ∆TC,c, (PPowerClass – ΔPPowerClass) – MAX(MAX(MPRc+∆MPRc, A-MPRc)+ ΔTIB,c + ∆TC,c +∆TRxSRS, P-MPRc) } |
| [**R4-2108927**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2108927.zip) | Nokia, Nokia Shanghai Bell | CR related to the above paper.  dTc is removed from relevant PCMAX\_L,f,c formulas. |
| [**R4-2110389**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2110389.zip) | Huawei, HiSilicon | Proposal 1: The understanding 1 “The source of ∆TC,c  is the same as NOTE 3 in table 6.2.1-1, therefore the 1.5dB relaxation shouldn’t be considered again when deciding TL,C” is correct.  Proposal 2: It is not expected to change the current requirements for lower limits of PUMAX,f,c and RAN4 can implement the corrections as option 1 to clarify it. |
| [**R4-2110421**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2110421.zip) | Huawei, HiSilicon | CR for the above paper.  Clarifying that tolerance TL,c doesn’t consider 1.5dB relaxation when deciding lower limit of Pumax. |
| [**R4-2110436**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2110436.zip) | ZTE Corporation | The 1.5dB relaxation shouldn’t be considered again when deciding TL,C. i.e. Understanding #1 is the correct understanding. |

## Open issues summary

### Sub-topic 1-1 Ambiguity in deciding TL,C

All contributions confirm that 1.5 dB relaxations shall not be counted twice as RAN5 pointed out. There are two draft CRs and three LS reply drafts available.

**Issue 1-1: Ambiguity in deciding TL,C**

* Proposals
  + Option 1: dTc is removed from relevant PCMAX\_L,f,c formulas. (Nokia)
  + Option 2: Clarifying that tolerance TL,c doesn’t consider 1.5dB relaxation when deciding T(PCMAX,f,c) (Huawei)
  + Option 3: A simple clarification to TS 38.101-1 by adding text “excluding ΔTC,c” (ZTE)
* Recommended WF
  + Agree either one of the above options; agree CR and LS drafts together.

## Companies views’ collection for 1st round

### Open issues

Sub topic 1-1

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Apple | Option 1  Option 1 looks more reasonable as 1.5dB is to account for further filter insertion loss which should be added outside the PCMAX equation. |

### 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** |
| 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 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: CA/DC NS

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

## Companies’ contributions summary

Here’s the list of contributions on CA/DC NS issues for TS 38.101-1.

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2109140**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2109140.zip) | SoftBank Corp. | A sentence is added on requirement when an NS is indicated in a band, according to WF(R4-2103120). |
| [**R4-2109143**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2109143.zip) | SoftBank Corp. | Rel-16 change of the above CR.  Cat A CR to Rel-17 (R4-2109145) |
| [**R4-2109153**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2109153.zip) | SoftBank Corp. | **[Proposal-1] As a baseline, it is proposed to confirm the current assumption that -50dBm/MHz can be met.**  **[Proposal-2] For exceptional cases, we should firstly agree a practical scope, which cases we need to address and which cases not.**  **[Proposal-3] If the group wants to continue this initiative, I’d like to ask a UE/chipset vendor delegate to take a lead with sufficient insight.** |
| [**R4-2109437**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2109437.zip) | Apple | **Proposal 1:** Consider UL RB restrictions and A-MPR for b20 if NS\_43 is signalled for DC\_20-n8, CA\_n8-n20 and CA\_8\_20.  **Proposal 2:** Consider the introduction of A-MPR for b20 if NS\_28 or NS\_31 is signalled for CA\_26-36.  **Proposal 3:** Consider the introduction of UL RB restrictions or the definition of A-MPR for n71 if NS\_18 is signalled for CA\_n28-n71. In case of NS\_17 no transmission in n71 can take place.  **Proposal 4:** Consider the introduction of UL RB restrictions or the definition of A-MPR for n39 if NS\_50 is signalled for CA\_n3-n39.  **Proposal 5:** Consider the introduction of A-MPR for the second UL covering all CA/DC combinations if NS\_04 or NS\_27 or NS\_43(LTE) are signalled.  **Proposal 6:** Consider the introduction of A-MPR and UL restrictions for n77 and n78 combinations if NS\_22(LTE) or NS\_23(LTE) is signalled for DC\_42-n77 and DC\_42-n78.  **Proposal 7:** Discuss the harmonic issues for all CA/DC combinations (provided in table 1) case by case and consider the introduction of A-MPR or exceptions for the second UL.  **Proposal 8:** Continue to discuss individual solutions for troubling CA/DC combinations.  **Proposal 9:** It should be required that with each new CA/DC combination NS requirements are checked for potential issues. |
| [**R4-2110288**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2110288.zip) | Huawei, HiSilicon | **Observation 1: Currently, the NS values** ***additionalSpectrumEmission* have been specified in a band specific manner for NR instead of UL CA/DC.**  **Observation 2: If the additional requirements for UL CA/DC will be introduced into specification, the additional requirements for UL CA/DC may not be tested for current field UEs.**  **Observation 3: Additional emission requirements used for band A NS\_XX may not be applied for the UL band combination CA\_A-B.**  **Proposal 1: It’s recommended to introduce additional emissions requirements for UL CA/DC one by one based on the operators’ request.**  **Proposal 2: It isn’t appropriate to introduce the additional requirements for UL CA/DC in Rel-15 TEI.** |
| [**R4-2110984**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2110984.zip) | Qualcomm Incorporated | **Proposal: Revert the agreement from [2] (R4-2103120). NS emission requirements only apply for the band in which they are signaled.** |

Here’s the list of contributions on CA/DC NS issues for TS 38.101-3.

|  |  |  |
| --- | --- | --- |
| [**R4-2109146**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2109146.zip) | SoftBank Corp. | A sentence is added on requirement when an NS is indicated in a band, according to the WF(R4-2103120)  Cat A CR to Rel-16 R4-2109148 |
| [**R4-2109149**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2109149.zip) | SoftBank Corp. | Rel-17 CR for the above CR. |

## Open issues summary

### Sub-topic 2-1 CA/DC NS

**Issue 2-1: CA/DC NS applicability**

* Proposals
  + Option 1: Single band NS is applicable to CA/DC according to agreed WF (Softbank); agree CRs to 38.101-1 and 38.101-3.
  + Option 2: Revert the agreed WF (Qualcomm)
  + Option 3: Introduce additional emissions requirements for UL CA/DC one by one based on the operators’ request. (Huawei)
  + Option 4: Continue to discuss individual solutions for troubling CA/DC combinations. It should be required that with each new CA/DC combination NS requirements are checked for potential issues. (Apple)
* Recommended WF
  + Collect views in 1st round and allocate a WF for the 2nd round.

**Issue 2-2: List of problematic NS**

* Softbank proposes that -50dBm/MHz can be met as a baseline and exceptional cases need to be identified. Problematic NS in CA/DC is analyzed by Apple as proposed below.
  + Proposal 1: Consider UL RB restrictions and A-MPR for b20 if NS\_43 is signalled for DC\_20-n8, CA\_n8-n20 and CA\_8\_20.
  + Proposal 2: Consider the introduction of A-MPR for b20 if NS\_28 or NS\_31 is signalled for CA\_26-36.
  + Proposal 3: Consider the introduction of UL RB restrictions or the definition of A-MPR for n71 if NS\_18 is signalled for CA\_n28-n71. In case of NS\_17 no transmission in n71 can take place.
  + Proposal 4: Consider the introduction of UL RB restrictions or the definition of A-MPR for n39 if NS\_50 is signalled for CA\_n3-n39.
  + Proposal 5: Consider the introduction of A-MPR for the second UL covering all CA/DC combinations if NS\_04 or NS\_27 or NS\_43(LTE) are signalled.
  + Proposal 6: Consider the introduction of A-MPR and UL restrictions for n77 and n78 combinations if NS\_22(LTE) or NS\_23(LTE) is signalled for DC\_42-n77 and DC\_42-n78.
  + Proposal 7: Discuss the harmonic issues for all CA/DC combinations (provided in table 1) case by case and consider the introduction of A-MPR or exceptions for the second UL.
* Recommended WF
  + Moderator suggests further study the above cases in general. In particular,
    - Moderator suggests companies to comment if -50 dBm/MHz limit can be met in general and also comment in what conditions the emissions may violate the limit.
    - Moderator suggests companies to comment if the above analysis by Apple is correct/incorrect, or more study is needed, etc.

## Companies views’ collection for 1st round

### Open issues

Sub topic 2-1

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Apple | Our contribution reveals that there exist several potential issues which have to be addressed. As the discussion is still evolving and there is no general strategy on how to handle those cases yet, we think it is too early to agree on the CRs proposed by Softbank. The agreement (made in the last WF) might need considerable changes depending according to the solutions taken for the troubling CA/DC cases. Our viewpoint is that the adjustments in emission handling and the solutions need to be agreed as a package and not as individual changes. |
| SoftBank | Sorry for lengthy comments first of all,  Option 1 is about how to capture a general rule and we also expect exceptions to the rule raised in ex. Option 4 by Apple. These are in line with the WF in the previous meeting(3120).  Option 2 seems to interpret as if option 1 is the only requirement imposed to any CA/DC, but it is not our intention. I hope the comment above clarifies the situation.  To Apple: For the comment above, please consider our comment on Option 3. Further postponing would increase serious risk as mentioned in Huawei’s contribution, i.e. looking like unspecified. Or would you give us a solution for the situation?  For Option 3, I’d like to get a feedback on the content of the contribution firstly.  The relevant contribution said as below:  “As discussed under the paper R4-2014307 in the first round from email summary paper [3], companies provided some important information that UL CA\_1-8 should not have PHS protection in the general CA/DC table while CA\_3-8 should do. It means that the additional emission requirements may not always be applied for UL CA\_A-B, even if the additional emission requirements are applicable for one band in this combinations. For instance, NS\_05 for PHS protection is applied for band 1, but PHS protection using NS\_05 is not applied for CA\_1-8”  I’d like to explain why this happens:  1) CA 1-8 for PHS protection had been in general UE co-ex table, at least by Mar 20 version, with a note ”applied with NS\_05”.  2) When we cleaned up UE co-ex table in May‘20 with the same fashion, i.e. putting the additional requirement in the general co-ex table with a note (applied with NS\_XX), they were a few comments from vendors, including Huawei, that capturing an additional requiremernt in the general table was not likely then we had to delete it. (You can check the situation in R4-2008292, first round summary)  3) The proposal from me this time is a continuation of to how to capture the additional requirement which was there but requested to be deleted in May last year.  So I am quite puzzled by the contribution from the standpoint of consistency of comments made by the same company. While I understand that vendor people are so busy, as a minimum, I’d sincerely ask delegates to check/consider what the colleagues said before.  For Japan-related CA/DC with NS, then it seems tests should be done at least before Jun 20 version because they were there. Is it correct? |

Sub topic 2-2

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Apple | After RAN4#98-e we did an exhaustive investigation to find potential cases which could violate NS requirements. The findings presented in the contribution can be split into two categories.  The first one covers all cases where NS requirements (signaled for the first UL) overlap with or are in near proximity with the second UL. In those cases we think that additional power backoff and UL RB restrictions could be a solution to comply with the emission limits.  The second category includes all cases where harmonics are located inside the NS requirements. The spurious emission tables for UE co-existence (e.g. 38.101-1 Clause 6.5.3.2) have exceptions for harmonics falling into protected regions. The exception allows emission levels up to the general spurious emission limits (please see note 2 in e.g. 38.101-1 Clause 6.5.3.2 for further details). This shows that the harmonics of a UE are generally not expected to do much better than those limits. This is the reason why we conducted a search on all CA/DC combinations to find the cases where harmonics can fall into NS protected regions. We do not claim that all listed cases are an issue (some are certainly not) but wanted to provide a full list for completeness and to be able to add more combinations which might have been overlooked. |
| SoftBank | For proposal-1, since NS\_43 in NR is for the protection of Band 18/19 range in Japan, this is not relevant to Region 1 where B20 is used. We do not have to worry about it.  For proposal-6, I guess this is for cases where B42 and B43 is not synchronized. We need to check if the assumption is still meaningful : B43 is left unused in LTE and integrated into n77/n78 in NR.  Foe the comment from Apple above: as written in 9153, we have assumed 2UL IMD does not violate -50dBm/MHz then the relevant evaluation has not been conducted. Also written in 9153, I cannot judge if there is a problem or not. Will you take a lead for studying this issue further? |

### 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”.*

# Topic #3: Maintenance of TS 38.101-1 and TS 38.307

## Companies’ contributions summary

Contributions related to UL MIMO EVM issues are listed.

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2108818**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2108818.zip) | Qualcomm Incorporated, Lenovo, Motorola Mobility | **Proposal 1: For 2L UL, EVM and EVM equalizer spectrum flatness shall be evaluated per layer regardless of diagonalization method chosen by RAN4.**  **Proposal 2: The reference receiver for the 2L UL MIMO EVM test case for slot length signals shall simultaneously measure the UE’s UL at both antenna connectors and implement a 2x2 LSE-based zero-forcing equalizer to diagonalize the channel.**  **Proposal 3: The minimum number of OFDM symbols to apply a 2x2 LSE-based zero-forcing equalizer is FFS.**  **Observation 1: Legacy UEs that meet the old 2L EVM requirement will also meet the new requirement with the new TE method.**  **Observation 2: Legacy TE built to the old 2L EVM requirement can cause false failures of compliant UEs.** |
| [**R4-2108815**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2108815.zip) | Qualcomm Incorporated, Lenovo, Motorola Mobility | **CR for the above discussion paper.** |
| [**R4-2109914**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2109914.zip) | Rohde & Schwarz | **Proposal 1:** RAN4 agrees on the presented approach for FR1 UL MIMO transmit signal quality.  The proposed dual receiver methodology in our view applies to the following:   * Error Vector Magnitude (EVM) for the allocated resource blocks (RBs) * EVM equalizer spectrum flatness derived from the equalizer coefficients generated by the EVM measurement process * Carrier leakage (caused by IQ offset)   **Proposal 2:** RAN4 further discusses the applicability of the approach to TxD once an agreement for UL MIMO has been achieved. |

Maintenance CRs (and companion discussion papers) to TS 38.101-1 are listed.

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2109379**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2109379.zip) | Qualcomm Incorporated | Observation 1: There are some frequency bands that use a split duplexer implementation due to narrow duplex gap. In that case UE may not support non-default TX-RX channel frequency separations  **Proposal 1: A note should be placed in table 5.4.4-1 stating: Bands n28 and n74 UE may only support the default TX-RX frequency separation values.** |
| [**R4-2108790**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2108790.zip) | Qualcomm Incorporated | CR for the above discussion paper.  Add note in table 5.4.4-1 for bands n28 and n74 to state that only the default TX-RX frequency separation values are supported |
| [**R4-2108869**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2108869.zip) | Rohde & Schwarz | Merged tables for 15, 30 and 60 kHz SCS, TDD and FDD into a single tables.  Removed redundant information.  Removed tables for 30 and 60 kHz SCS.  Removed TDD tables.  Added new table for TDD active uplink slots.  Updated references to Annex A.2. |
| [**R4-2108977**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2108977.zip) | Dish Network | Modifying asymmetric UL/DL configurations to fix CR R4-2101992 implementation |
| [**R4-2109166**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2109166.zip) | NTT DOCOMO, INC. | Based on the R4-2103134 agreed in RAN4#98-e, the following requirements will be added.   1. Co-existence requirements from n40 to Japan bands and PHS. 2. Co-existence requirements from Japan bands to B40. This change is only seen in CAT-A CR. 3. Co-existence requirements for CA to be modified according to the above changes. This change is only seen in CAT-A CR.   However, co-existence requirements between n40 and n41 are currently under discussion in RAN4, so they are not included in this CR. |
| [**R4-2109453**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2109453.zip) | Apple | 1. Band 12: Harmonic exceptions for band 48 has been missed. Removed harmonic exception from band 70 as it is not affected by any harmonic.  2. n28, n83: Harmonic exceptions are added for band 11 and 21 as they can both be affected by second harmonic. |
| [**R4-2111367**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2111367.zip) | Huawei, HiSilicon | Add a note to clarify the tolerance is referring to close loop power control. |

CRs to TS 38.307 are listed.

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2110424**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2110424.zip) | Huawei, HiSilicon | Delete the column “duplex mode” for band combinations |
| [**R4-2110448**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2110448.zip) | ZTE Corporation | By using the similar method of TS36.307, the NOTE for each ‘duplex-mode’ in the table is added. Also duplex mode of ‘SDL and FDD’ and ‘FDD and TDD’ are added for PC3 inter-band NR CA and ENDC, respectively. |

## Open issues summary

Please comment to CR drafts directly in 3.3.2, other than the sub-topic 3-1.

### Sub-topic 3-1 UL MIMO EVM

**Issue 3-1: UL MIMO EVM**

* Proposals
  + Option 1: EVM and EVM equalizer spectrum flatness shall be evaluated per layer based on R4-2108818. (Qualcomm, Lenovo, Motorola)
  + Option 2: FR1 UL MIMO transmit signal quality is measured per layer based on R4-2109914 (R&S)
* Recommended WF
  + Collect comments in the first round.

## Companies views’ collection for 1st round

### Open issues

Sub topic 3-1

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX |  |

### 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 |
|  |
| [**R4-2109379**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2109379.zip)  [**R4-2108790**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2108790.zip) | Apple:  We do not see the necessity for this CR. The non-default Tx-Rx separation happens when the UL and DL channel BWs are not symmetric. The range of Tx-Rx separation is determined by the delta between the UL and DL channel BWs, not how the duplexer is implemented. |
| [**R4-2108869**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2108869.zip) |  |
| [**R4-2108977**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2108977.zip) |  |
| [**R4-2109166**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2109166.zip) | Apple:  The CAT A CR as mentioned in this CR should be CAT F CRs as the CR contents are expected to be different from this CR. They should be reviewed together with this CR before the agreement. |
| [**R4-2109453**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2109453.zip) | Apple: Uploaded revision. The revision does not anymore add harmonic exceptions (i.e. note 2) for all cases where notes 24 and 25 (also granting harmonic exception) are present. |
| [**R4-2111367**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2111367.zip) | Apple:  There is no “close loop power control” defined in RAN4 specifications. The requirements related to close-loop power control are referred to “relative power tolerance”. However, we do not see how the power class tolerance is related to the “relative power tolerance”. Therefore, this note is not needed. |
| [**R4-2110424**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2110424.zip) |  |
| [**R4-2110448**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2110448.zip) |  |

## 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”.*

# Topic #4: TS 38.101-2 maintenance

## Companies’ contributions summary

Contributions related to EESS protection (WRC-19) is listed in the following.

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2110808**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2110808.zip) | OPPO | ***Observation 1: Introducing now or in the future is the main difference for 2024/2027 requirements.***  ***Observation 2: Introduction of NS\_203 has set a good example on how to introduce requirement for the near future.***  ***Observation 3: Possibility of forgetting these 2024/2027 requirements in RAN4 is low.***  ***Observation 4: Without being required by regulatory bodies, the meaning of introducing future requirements is low.***  ***Observation 5: Comparing introducing now, postpone defining the 2024/2027 requirements will have less impact to RAN4/RAN5/GCF and also the industry.***  ***Proposal 1: Postpone defining the 2024/2027 requirements, NS\_203 approach can be used as reference in future.*** |
| [**R4-2111509**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2111509.zip) | NTT DOCOMO INC. | **Proposal 1: Update each option as option 1-a and 2-a, and clarify the following aspects:**   * **For Option 1-a: Not introducing the requirements after 2024/2027 in the current spec, but RAN4 can further discuss them whenever it is necessary,**   + **An appropriate length of the period to make chipset, UE, NW, and TE compatible with new NS(s) should be investigated so that the UE can meet EESS protection and be tested for regulatory compliance after changeover date,**   + **How to implement mandatory support indication by modified MPR correctly in the specification around 2024/2027(Where to capture the previous agreements for future work).** * **For Option 2-a: Introduce NS\_20Y (-5dBm/200MHz protection for n257/n258 applied after 2027) into standard now and use normative or informative notes like ‘applicable from <calendar date>’ to indicate the changeover dates (handling of NS\_20X is FFS),**   + **How to write the description of NOTE to address potential issues.**   **Proposal 2: Take option 2-a as baseline and focus on how to write the description of NOTE to address potential issues.** |

Contributions related to RF requirement under ETC is listed in the following.

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2109671**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2109671.zip) | vivo | **Observation 1**: From testability perspective, the supporting of 3D scan with extreme temperature condition is confirmed. The impacts on test system under ETC condition is under discussion in FR2 enhanced test methods SI.  **Observation 2**: The impacts on UE performance under ETC is related to the applicability or relaxation of core requirement, which is suggested to be discussed in Rel-15 FR2 RF TEI based on RAN4 leadership guidance.  **Observation 3:** The following core requirements are Not applicable for extreme environmental testing conditions (i.e. defined based on normal conditions), i.e., *EIRP/EIS spherical coverage, Power control, EVM/EVM equalizer spectrum flatness, Beam correspondence*.  **Observation 4:** Among the requirements in observation 3, the following requirements are only applicable (i.e. defined based on) for normal conditions, i.e., *Power control (Single carrier/CA),* *EVM/ EVM spectral flatness (Single carrier/CA/UL MIMO)*.  **Observation 5:** EIRP/EIS spherical coverage (Single carrier/CA/UL MIMO) and Beam correspondence are verified only under normal thermal conditions. Companies still share different views on whether these requirements are defined based on NTC or not.  **Proposal 1: Based on the clear applicability of the requirements of Power control (Single carrier/CA), EVM/ EVM spectral flatness (Single carrier/CA/UL MIMO), RAN4 can conclude that these requirements are only for NTC.**  **Proposal 2: RAN4 should limit the ETC requirement discussion on spherical coverage and beam correspondence, and further discuss the necessity on ETC test for these two RF requirements.**  **Proposal 3: RAN4 need to study the impacts of spherical coverage and beam correspondence requirements under ETC, or define new requirements for ETC spherical coverage and ETC beam correspondence.**  **Proposal 4: A simulation campaign is needed to calculate the impacts of temperature on spherical coverage and beam correspondence.**  **Proposal 5: Send a LS to RAN5 to clarify the applicability of RF core requirement with applicability restrained to NTC.** |
| [**R4-2111508**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2111508.zip) | Keysight Technologies UK Ltd | **Observation 1: Unless otherwise stated, all core requirements are applicable either under nominal or extreme environmental testing conditions.**  **Proposal 1: RAN4 to confirm that, unless otherwise stated, all core requirements are applicable under nominal and extreme environmental testing conditions.**  **Proposal 2: RAN4 to confirm that existing EIRP/EIS spherical coverage core and beam correspondence core requirements apply under extreme temperature conditions. Hence changes described in [11] (R4-2111507) are agreeable.** |
| [**R4-2111507**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2111507.zip) | Keysight Technologies UK Ltd | Notes indicating core requirements are only applicable under normal thermal conditions are voided. |

Other maintenance CR to TS 38.101-2 is listed in the following, together with companion discussion papers.

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2108787**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2108787.zip) | Qualcomm Incorporated | “each” is replaced by “all” and *cell* is changed to its plural *cells* to clarify that UE uses grants for all cells to determine Pcmax. |
| [**R4-2108819**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2108819.zip) | Qualcomm Incorporated | **Proposal 1: Make the** Pmin **requirement (6.3.1, 6.3x.1) consistent across all use-cases by scaling the requirement with baseband BW (Number of UL layers \* RF bandwidth).**  **Observation 1: The ‘shared gain’ approach of adopting the Pmin requirement for 100 MHz channels as the new Pmin PSD requirement represents both, a 3 dB relaxation of UE RF requirements and a 3 dB network improvement for 50 MHz deployments.**  **Proposal 2: The PC2/3/4 Pmin requirement shall be scaled from a Pmin PSD requirement of -13 dBm per 100 MHz of baseband bandwidth.**  **Proposal 3: The PC1 Pmin requirement shall be scaled from a Pmin PSD requirement of +4 dBm per 100 MHz of baseband bandwidth.**  **Proposal 4: The PC5 Pmin requirement shall be scaled from a Pmin PSD requirement of -6 dBm per 100 MHz of baseband bandwidth.** |
| [**R4-2108820**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2108820.zip) | Qualcomm Incorporated | CR for the above discussion paper |
| [**R4-2108872**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2108872.zip) | Rohde & Schwarz | Merged tables for 60 and 120 kHz SCS.  Removed redundant information.  Removed tables for 120 kHz SCS. |
| [**R4-2108875**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2108875.zip) | Rohde & Schwarz | Change IBE requirements to the same metrics as other emission measurements.  Added statement that defines the requirements in Tx beam peak direction. |
| [**R4-2110151**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2110151.zip) | Apple | Proposal 1: RAN4 shall apply the corrected values for the minimum SSB and minimum CSI-RS as provided in Table 1 and Table 2. |
| [**R4-2110176**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2110176.zip) | Apple | The CR for the above discussion paper. |
| [**R4-2111358**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2111358.zip) | Huawei, HiSilicon | Adding sentence for CA SEM and CA spurious requirement: the LO leakage and IQ image may land outside configured UL and DL CCs |
| [**R4-2111364**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2111364.zip) | Huawei, HiSilicon | Add MBR requirements for UEs support multiple FR2 band. |
| [**R4-2111415**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2111415.zip) | Qualcomm Incorporated | Create definition in section 3, and remove multiple duplicated definitions in body of requirements |

## Open issues summary

EESS protection issue is discussed in Sub-topic 4-1 and ETC issue is in Sub-topic 4-2. For other maintenance CRs, leave comments in 4.3.2.

### Sub-topic 4-1 EESS protection

**Issue 4-1: EESS protection (WRC-19)**

* Proposals
  + Option 1: Postpone defining the 2024/2027 requirements, NS\_203 approach can be used as reference in future. (OPPO)
  + Option 2: Introduce NS\_20Y (-5dBm/200MHz protection for n257/n258 applied after 2027) into standard now and use normative or informative notes like ‘applicable from <calendar date>’ to indicate the changeover dates (handling of NS\_20X is FFS) (NTT Docomo)
* Recommended WF
  + Collect comments in the first round.

### Sub-topic 4-2 RF requirement applicability under ETC

**Issue 4-2-1: RF requirement applicability under ETC**

* Proposals
  + Option 1: Power control (Single carrier/CA), EVM/ EVM spectral flatness (Single carrier/CA/UL MIMO) are only for NTC; discuss ETC requirement only for spherical coverage and beam correspondence. (vivo)
  + Option 2: All core requirements are applicable under nominal and extreme environmental testing conditions unless otherwise stated. Existing EIRP/EIS spherical coverage core and beam correspondence core requirements apply under extreme temperature conditions (Keysight)
  + Option 3: others
* Recommended WF
  + Collect comments in the first round.

**Issue 4-2-2: Spherical coverage and beam correspondence requirement under ETC (Next step)**

* Proposals
  + Option 1: A simulation campaign is needed to calculate the impacts of temperature on spherical coverage and beam correspondence. (vivo) (Moderator questions if this is a proposal to SI FR2 testability? Should it be handled in this agenda?)
  + Option 2: other.
* Recommended WF
  + Collect comments in the first round.

**Issue 4-2-2: CR to 38.101-2**

* Proposals
  + Option 1: Agree CR R4-2111507, i.e., notes indicating core requirements are only applicable under normal thermal conditions are voided in EIRP/EIS spherical coverage and beam correspondence requirements (Keysight)
  + Option 2: No CR yet. Or revision needed.
* Recommended WF
  + Collect comments in the first round.

**Issue 4-2-3: LS to RAN5**

* Proposals
  + Option 1: Send LS to RAN5 about RAN4 status according to R4-2109671 (vivo)
  + Option 2: No LS yet. Or revision needed.
* Recommended WF
  + Collect comments in the first round.

## Companies views’ collection for 1st round

### Open issues

Sub topic 4-1

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Apple | Option 1 |

Sub topic 4-2

|  |  |
| --- | --- |
| **Company** | **Comments** |
| vivo | Issue 4-2-1: RF requirement applicability under ETC  Support Option 1. For spherical coverage and beam correspondence, we still need to discuss the applicability and relaxation.  Issue 4-2-2: Spherical coverage and beam correspondence requirement under ETC (Next step):  Support option1. Clarification feedback to moderator: the test method part is close to be finalized in testability SI, the open issue is whether some RF requirements should be tested under ETC (or defined based on ETC assumption). Option 1 is for RF core requirement relaxation, based on guidance from Vice-chair during GTW session, modification of any RF core requirement should be discussed and concluded in this agenda.  Issue 4-2-3: CR to 38.101-2  Can not agree the CR. The applicability of some RF requirements is not concluded yet.  Issue 4-2-3: LS to RAN5  LS is needed in this meeting. RAN5 is discussing in parallel whether to test all the FR2 RF test cases under ETC, this is highly dependent on the applicability of RF core requirements in RAN4. Therefore, clear guidance from RAN4 should be informed to RAN5 ASAP, to avoid making incorrect conclusion of ETC conformance test cases in RAN5. |
| MediaTek | **Issue 4-2-1: RF requirement applicability under ETC**  Support Option 1, and echo vivo’s comment “For spherical coverage and beam correspondence, we still need to discuss the applicability and relaxation.”  **Issue 4-2-2: Spherical coverage and beam correspondence requirement under ETC (Next step):**  Support Option1. Evaluate the impact by simulation is important.  **Issue 4-2-3: CR to 38.101-2**  Support Option 2. There is no consensus so far.  **Issue 4-2-3: LS to RAN5**  Support Option1. Sync-up with RAN5 for the latest RAN4 status is good. |
|  |  |

### 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 |
|  |
| [**R4-2108787**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2108787.zip) |  |
| [**R4-2108819**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2108819.zip)  [**R4-2108820**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2108820.zip) | Apple: We support the Pmin scaling proposal and the CR. |
| [**R4-2108872**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2108872.zip) |  |
| [**R4-2108875**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2108875.zip) |  |
| [**R4-2110151**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2110151.zip)  [**R4-2110176**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2110176.zip) |  |
| [**R4-2111358**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2111358.zip) | Apple: What is the purpose for adding this sentence? |
| [**R4-2111364**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2111364.zip) | Apple: The intention for this CR is understandable. But the wording of the added sentences can be improved if the CR would be agreeable. Also the contents between clause 6.1 and clause 6.6 were missing without a section divider. |
| [**R4-2111415**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2111415.zip) |  |

## 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”.*

# Topic #5: intra/inter-band Contiguous/Non-Contiguous MRDC

## Companies’ contributions summary

A list of contributions regarding contiguous/non-contiguous MRDC issues is found in the following table.

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2110032**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2110032.zip) | NTT DOCOMO INC. | **Observation 1: interBandContiguousMRDC is a similar UE capability to intraBandENDC-Support but applies to intra band-basis inter band EN-DC such as DC\_42\_n77 and DC\_42\_n78. The difference between these capabilities is that supportiveness of non-contiguous is mandatory for interBandContiguousMRDC.**  **Proposal 1: Agree CR (R4-2108803) [6] to correct the description of NOTE4** **in Table 5.5B.4.1-1 in TS 38.101-3 based on the previous agreements.**  **Proposal 2: Apply the following interpretation for intra band contiguous and non-contiguous EN-DC related to intraBandENDC-Support and interBandContiguousMRDC capability:**   * **If UE supports the case where one of LTE carriers is contiguous with one of NR carriers, UE needs to indicate contiguous EN-DC capability.** * **If UE supports the case where one of LTE carriers is non-contiguous with one of NR carriers, UE needs to indicate non-contiguous EN-DC capability.** * **If UE supports above both cases, UE needs to indicate both contiguous and non-contiguous EN-DC capability.** * **The interpretation should be applied to both UL and DL.**   **Applicability to UL parts can be revisited if some issues are identified.** |
| [**R4-2108803**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2108803.zip) | NTT DOCOMO INC. | CR for the above discussion paper regarding inter-band MRDC. |
| [**R4-2109781**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2109781.zip) | Nokia, Nokia Shanghai Bell | **Proposal 1: For UE supporting the intra-band non-contiguous EN-DC for the number of carriers (combined both LTE and NR) more than two shall support the contiguous EN-DC as well.**  **Proposal 2: UE is not allowed to signal only the support of the intra-band non-contiguous EN-DC if the number of carriers (combined both LTE and NR) are more than two.**  **Proposal 3: All carriers (between LTE carrier and NR carrier, within LTE carriers or within NR carriers, both UL and DL) shall be contiguous, if UE indicates only the support of intra-band contiguous EN-DC, without the support of non-contiguous EN-DC.**  **Proposal 4: The same BCS shall be applied between contiguous and non-contiguous EN-DC.**  **Proposal 5: For mixed intra-band and inter-band EN-DC (for example DC\_48A\_n48A-n71), the UE capability definition is applied to the intra-band part (DC\_48A\_n48A) of the carriers.**  **Proposal 6: The multiple intra-band EN-DC components (for example, DC\_48A-71A\_n48A\_n71A) shall not be allowed (at least by this 3GPP release (Rel-17)).**  **Proposal 7: Inform RAN2 about RAN4 understanding of this UE capability.** |
| [**R4-2109782**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2109782.zip) | Nokia, Nokia Shanghai Bell | CR for the above discussion paper. |
| [**R4-2110154**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2110154.zip) | Apple | ***Observation 1****: Irrespective of how many CCs are configured in each cell group, each cell group should always allow its own configuration to fall back to its primary cell only.*  ***Observation 2****: RAN2 signalling design for intra-band EN-DC combinations includes LTE DL CA configuration, LTE UL CA configuration, NR DL CA configuration, NR UL CA configuration, and the EN-DC part of the configuration is signalled by the parameter intraBandENDC-support.*  ***Observation 3****: If a UE is capable of supporting non-contiguous configuration in either DL or UL, it should also be able to support contiguous configuration in the corresponding DL or UL, but not the other way around.*  ***Proposal 1****: For intra-band EN-DC, contiguous or non-contiguous is determined by the configuration between the primary cells from each cell group.*  ***Proposal 2****: Only the configuration between LTE and NR sub-blocks are relevant to the contiguous or non-contiguous definition of the intra-band EN-DC combinations.*  ***Proposal 3****: The existing RAN2 signalling design is sufficient to indicate UE’s support for different intra-band EN-DC configurations. There is no need to introduce new signalling to differentiate intra-band DL and UL EN-DC configurations separately.* |
| [**R4-2110155**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2110155.zip) | Apple | CR for the above discussion paper. |
| [**R4-2110156**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2110156.zip) | Apple | Rel-16 CR for the above discussion paper. |
| [**R4-2110807**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2110807.zip) | OPPO | ***Observation 1: Current spec doesn’t consider the UL CC locations when specify the intra-band contiguous or non-contiguous EN-DC.***  ***Observation 2: In current spec the band combination is considered as intra-band contiguous only when all the DL CCs are contiguous.***  ***Observation 3: The DL and UL capability in supporting intra-band contiguous or non-contiguous is different, and new signaling might be needed then release independent will be a problem.***  ***Observation 4: For current intra-band contiguous EN-DC case2 (e.g. DC\_(n)41CA with UL DC\_41A\_n41A), NW can only fall back to intra-band non-contiguous EN-DC, i.e. DC\_41A\_n41A which will violate 38.306 fallback restriction.***  ***Observation 5: If consider the intra-band contiguous EN-DC only based on PCC and PSCC, then the 38.306 fallback restriction (non-contiguous is not a fallback of contiguous) can be aligned.***  ***Observation 6: No new capability signaling is needed to differentiate UL and DL, if classify the intra-band contiguous or non-contiguous EN-DC only based on the PCC and PSCC.***  ***Proposal 1: It is proposed to*** ***interpret intra-band EN-DC contiguous or non-contiguous based on the PCC and PSCC and no new signaling need to be defined.***  ***Observation 7: Current RAN2 signaling cannot differentiate the two band combinations, i.e. DC\_48A\_(n)48AA and DC\_48A-48A\_n48A both with UL DC\_48A\_n48A.***  ***Observation 8: An alternative is to classify the intra-band contiguous EN-DC by the condition that CCs between LTE and NR are contiguous and remove the 38.306 band combination fallback restriction.***  ***Proposal 2: It is proposed to*** ***further consider classify the intra-band contiguous EN-DC by the condition that there are CCs between LTE and NR are contiguous and remove the 38.306 band combination fallback restriction if the proposal 1 approach is not doable.*** |
| [**R4-2110982**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2110982.zip) | Qualcomm Incorporated | **Proposal 1: Adopt option 2. The entire LTE and NR spectrum are contiguous, i.e., all carriers are contiguously spaced. In other word, all the adjacent carriers including intra LTE carriers and intra NR carriers are contiguously spaced.**  **Observation: Separate signaling for UL and DL enables greater flexibility to support different EN-DC scenarios and is recommended to be introduced in Rel-16. If separate signaling is not available for Rel-15, then the lowest capability between UL and DL should be reported where the lowest capability is regarded as C-only. Some scenarios will not be able to be configured by the network as a consequence.**  **Proposal 2: EN-DC C-to-NC fallback is not required to be supported by the UE. On the other hand, it is expected that the UE supports NC-to-C fallback.**  **Proposal 3: The UE RF requirements for intra-band contiguous and non-contiguous EN-DC should be updated to reflect the possibility of intra-band contiguous or non-contiguous CA within the E-UTRA and/or NR cell group. The principle that contiguous carriers, whether they are E-UTRA or NR, are treated as a single sub-block while non-contiguous carriers are treated independently should apply.** |
| [**R4-2111111**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2111111.zip) | Google Inc. | **Observation 1: The DC\_48A\_(n)48AA with UL DC\_48A\_n48A is an intra-band non-contiguous EN-DC band combination.**  **Proposal 1: Do not introduce the new signaling for intra-band EN-DC UL and DL configuration.**  **Proposal 2: Redefine the following intra-band EN-DC combination**   * **DC\_(n)48CA with UL DC\_48A\_n48A is an intra-band non-contiguous EN-DC combination** * **DC\_48A\_(n)48AA with UL DC\_(n)48AA is an intra-band contiguous EN-DC combination** |
| [**R4-2111353**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2111353.zip) | Huawei, HiSilicon | ***Observation 1: In TS 38.101-3, contiguous or non-contiguous EN-DC is defined only based on DL configuration.***  ***Observation 2: UE is not allowed to indicate intra-band EN-DC contiguous/non-contiguous capability in UL or DL separately.***  ***Proposal 1: IntraBandENDC-Support IE should be indicated in UL and DL separately per band combination. Send LS to RAN2 to introduce new UE capability on distinguish intra-band ENDC UL and DL contiguous/non-contiguous support.***  ***Proposal 2: Ask RAN2 to early implement intraBandENDC-Support IE in UL and DL separately per band combination in Rel-15 spec.*** |

## Open issues summary

### Sub-topic 5-1 Intra-band EN-DC

**Issue 5-1-1: intraBandENDC-Support definition**

* Proposals
  + Option 1: For intra-band EN-DC, contiguous or non-contiguous is determined by the configuration between the primary cells from each cell group. (Apple, OPPO)
  + Option 2: The entire LTE and NR spectrum are contiguous, i.e., all carriers are contiguously spaced for contiguous EN-DC. (Qualcomm, Nokia, [NTT Docomo?])
    - Option 2a: If separate UL/DL signaling is not available, then the lowest capability between UL and DL should be reported where the lowest capability is regarded as C-only. Some scenarios will not be able to be configured by the network. (Qualcomm)
    - Option 2b: Not allowed only signaling non-contiguous for more than two carriers. Both must be signaled for all possible mixed configurations (Nokia)
  + Option 3: If UE supports the case where one of LTE carriers is contiguous with one of NR carriers, UE needs to indicate contiguous EN-DC capability. If UE supports the case where one of LTE carriers is non-contiguous with one of NR carriers, UE needs to indicate non-contiguous EN-DC capability. If UE supports above both cases, UE needs to indicate both contiguous and non-contiguous EN-DC capability. The interpretation should be applied to both UL and DL. (NTT Docomo)
  + Option 4: IntraBandENDC-Support IE should be indicated in UL and DL separately per band combination. (Huawei, Qualcomm)
  + Option 5: Redefine DC\_(n)48CA with UL DC\_48A\_n48A non-contiguous, DC\_48A\_(n)48AA with UL DC\_(n)48AA contiguous not to violate fallback operation (Google)
* Recommended WF
  + Collect views in the 1st round.

**Issue 5-1-2: Impact to UE capability signaling**

* Proposals
  + Option 1: Ask RAN2 to introduce or modify UE capability signaling.
    - Option 1a: Change needed from Rel-15. (Huawei)
    - Option 1b: Keep Rel-15 signaling. Introduce enhancement from Rel-16.
  + Option 2: No new signaling is needed (Apple, Google)
    - Option 2a: Some clarification of existing signaling may be needed in RAN2.
    - Option 2b: No change at all to RAN2 is needed.
* Recommended WF
  + Collect views in the 1st round.

**Issue 5-1-3: Fallback from C to NC and NC to C.**

* Proposals
  + Option 1: Fallback from C to NC is not required but NC to C is required. (Qualcomm)
  + Option 2: None of cross C-NC fallbacks is required.
  + Option 3: It depends on UE capability.
    - Option 3a: UE capable of both C and NC can support the fallback from C to NC, as well as from NC to C.
    - Option 3b: others
  + Option 4: Removing RAN2 38.306 fall back restriction might be needed. (OPPO)
* Recommended WF
  + Collect views in the 1st round

**Issue 5-1-4: UE RF requirement update**

* Proposals
  + Option 1: The UE RF requirements for intra-band contiguous and non-contiguous EN-DC should be updated to reflect the possibility of intra-band contiguous or non-contiguous CA within the E-UTRA and/or NR cell group. (Qualcomm)
  + Option 2: UE RF requirement change is not required.
* Recommended WF
  + Collect views in the 1st round

**Issue 5-1-5: BCS issue**

* Proposals
  + Option 1: The same BCS shall be applied between contiguous and non-contiguous EN-DC. (Nokia)
  + Option 2: Others
* Recommended WF
  + Collect views in the 1st round

**Issue 5-1-6: Mixed intra and inter-band EN-DC**

* Proposals
  + Option 1: For mixed intra-band and inter-band EN-DC (for example DC\_48A\_n48A-n71), the UE capability definition is applied to the intra-band part (DC\_48A\_n48A) of the carriers. The multiple intra-band EN-DC components (for example, DC\_48A-71A\_n48A\_n71A) shall not be allowed (at least by this 3GPP release (Rel-17)). (Nokia)
  + Option 2: Others
* Recommended WF
  + Collect views in the 1st round

### Sub-topic 5-2 Inter-band EN-DC

**Issue 5-2: interBandContiguousMRDC**

* Proposals
  + Option 1: The minimum requirements for intra-band non-contiguous EN-DC apply (always). When interBandContiguousMRDC is indicated, the minimum requirements for both intra band contiguous and non-contiguous EN-DC apply. Approve R4-2108803. (NTT Docomo)
  + Option 2: Other than Option 1
* Recommended WF
  + Option 1

If UE supports the case where one of LTE carriers is contiguous with one of NR carriers, UE needs to indicate contiguous EN-DC capability. If UE supports the case where one of LTE carriers is non-contiguous with one of NR carriers, UE needs to indicate non-contiguous EN-DC capability. If UE supports above both cases, UE needs to indicate both contiguous and non-contiguous EN-DC capability. The interpretation should be applied to both UL and DL.

## Companies views’ collection for 1st round

### Open issues

Sub topic 5-1-1

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Apple | Option 1 and Option 5 |
| Verizon | Option 3 is clearer although there are a lot similarity from other options. |

Sub topic 5-1-2

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Apple | Option 2 |
| Verizon | Option 2a |

Sub topic 5-1 -3

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Apple | Option 1 (for CA)  For EN-DC part of the combination, if contiguous or non-contiguous definition is based on the configuration between the primary cells, there would be no cross C-NC fallback. |
| Verizon | Option 2 |

Sub topic 5-1-4

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Apple | Option 1 if found necessary.  For DC\_(n)41DA, the maximum aggregated BW is 160 MHz. The current requirements have been defined with aggregated BW up to 160 MHz. |

Sub topic 5-1-5

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Apple | Option 2: It is up to operator’s request. |
| Verizon | Option 1 |

Sub topic 5-1-6

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Apple | Option 2: Depending on the configuration between the primary cells, the EN-DC can be intra-band or inter-band. |

Sub topic 5-2

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Apple | This is most likely related to the specific combination of DC\_42\_n77 where B42 carrier is adjacent to n77 carrier (contiguous). The requirements should be based on intra-band contiguous configuration. But how to define the requirements can be further discussed as there is no such intra-band EN-DC combination defined. |
| Verizon | Option 1 |

### 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”.*

# Topic #6: TS 38.101-3 maintenance

## Companies’ contributions summary

Here’s the list of contributions related to the maintenance of TS 38.101-3.

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2108878**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2108878.zip) | Rohde & Schwarz | Added missing references to other specifications.  Correct table 6.5B.3.3.2-1 Note 10 from -36dBm/MHz to -38dBm/MHz |
| [**R4-2109155**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2109155.zip) | SoftBank Corp. | **[Observation-1] There are two different CIM5 used in RAN4 context, on the same or the other side of CIM3.**  **[Proposal-1] The definition of CIM5 should be clarified first of all.**  **[Option-1] CIM5 appears on the other side of CIM3.**  **[Option-2] CIM5 appears on the same side of CIM3.**  **[Option-3] Other alternatives.**  **[Proposal-2] The CRs [1] should be revisited if necessary.** |
| [**R4-2109169**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2109169.zip) | NTT DOCOMO, INC. | Based on the R4-2103134 agreed in RAN4#98-e, the following requirements will be added.   1. Co-existence requirements from DC between Japan band and B40/n40 to Japan bands and PHS. 2. Co-existence requirements from DC between Japan bands to B40.   However, co-existence requirements between n40 and n41 are currently under discussion in RAN4, so they are not included in this CR. |
| [**R4-2109455**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2109455.zip) | Apple | 1. CA\_1-28: Added harmonic exception for bands 1, 11, 21 and 65 as they can be affected by scond and third harmonic 2. DC\_2\_n5: Added harmonic exception for bands 31, 43, and 53 as they can be affected by scond and third harmonic 3. DC\_3\_n28: Added harmonic exception for bands 11 and 21 as they can be affected by scond and third harmonic 4. DC\_3\_n51: Added harmonic exception for band 48 as it can be affected by scond harmonic 5. DC\_3\_n82: Added harmonic exception for bands 22, 38, 69 as they can be affected by scond and third harmonic 6. DC\_5\_n40: Added harmonic exception for bands 41 and 52 as they can be affected by third and fourth harmonic 7. DC\_5\_n78: Added harmonic exception for band 41 as it can be affected by scond harmonic (Harmonic exception is also defined in CA\_n5\_n78) 8. DC\_12\_n5: Added harmonic exception for bands 42 and 51 as they can be affected by second and fifth harmonic 9. DC\_20\_n8: Added harmonic exception for bands 3, 7, 22, 38, 42, 43 and n78 as they can be affected by second, third and fourth harmonic 10. DC\_20\_n28: Added harmonic exception as found for CA\_n20\_n28 which includes n78 11. DC\_26\_n77 & DC\_26\_n78 & DC\_26\_n79: Added harmonic exception for band 41 as it can be affected by thrid harmonic. Also added harmonic exception for fifth frequency range as it can be affected by thrid harmonic. 12. DC\_28\_n77: Added harmonic exception for bands 11, 21 and 74 as they can be affected by second and thrid harmonic 13. DC\_28\_n78: Added harmonic exception for bands 11 and 21 as they can be affected by second harmonic 14. DC\_28\_n79: Added harmonic exception for bands 11, 21 and 42 as they can be affected by second, third and fifth harmonic 15. DC\_66\_n71: Added harmonic exception for bands 7and 22 as they can be affected by second and fourth harmonic |
| [**R4-2110445**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2110445.zip) | ZTE Corporation | Correct the ΔTIB,c description for FR1-FR2 inter-band CA combination. |

## Open issues summary

Sub-topic 6-1 is for discussing the issues about counter intermodulation raised by Softbank. The comments to other CRs should be made in 6.3.2.

### Sub-topic 6-1 Clarification of CIM

R4-2109155 questions the CRs previously agreed in RAN4#98. (R4-2003357/2095/2096).

**Issue 6-1: Clarification of CIM**

Please comment whether further clarification is needed as discussed by Softbank, i.e., whether the agreed CR should be checked again, or not.

* Proposals
* The definition of CIM5 should be clarified first of all.
  + [Option-1] CIM5 appears on the other side of CIM3.
  + [Option-2] CIM5 appears on the same side of CIM3.
  + [Option-3] Other alternatives.
* Recommended WF
  + Collect comments in the first round.

## Companies views’ collection for 1st round

### Open issues

Sub topic 6-1 Clarification of CIM

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Apple | Option-2: CIM5 appears on the same side of CIM3.  We can call IM5 on the other side of CIM3. |

For other contributions than CIM issues, comments should be provided in 6.3.2

### 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 |
|  |
| [**R4-2108878**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2108878.zip) |  |
| [**R4-2109169**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2109169.zip) |  |
| [**R4-2109455**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2109455.zip) | Apple: Uploaded revision. The revision does not anymore add harmonic exceptions (i.e. note 2) for all cases where notes 10 and 11 (also granting harmonic exception) are present. |
| [**R4-2110445**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2110445.zip) |  |

## 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