**3GPP TSG-RAN WG4 Meeting # 97-e R4-200XXXX**

**Electronic Meeting, 2 – 13 November, 2020**

**Agenda item:** 4.2.3

**Source:** Moderator (Huawei)

**Title:** Email discussion summary for [97e][104] NR\_NewRAT\_UE\_RF\_Part\_3

**Document for:** Information

# Introduction

This email discussion handles the contributions submitted to agenda item 4.2.3, 4.2.3.1, 4.2.3.2 and 4.2.3.3. The scope of this email discussion covers Rel-15 UE RF requirements maintenance on TS 38.101-3, which specifies the UE RF requirements for EN-DC operations. There are 4 topics (Simultaneous Rx/Tx UE capability, Rx requirements, Tx requirements and others) in this email discussion and multiple sub-topics within each of them. Note that since this discussion is mainly maintenance work we will start to agree on CRs and mirror CRs in the first round. In the second round only the contentious issues are discussed. There is no GTW time slot planned so far for this email discussion.

# Topic #1: Simultaneous Rx/Tx UE capability

Topic #1 handles the issue identified upon UE capability of simultaneous Rx/Tx operation under NR CA, SUL, EN-DC and NR-DC combinations. The moderator uses colours for mapping between papers/proposals and sub-topics.

## Companies’ contributions summary

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| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2016469 | Huawei, HiSilicon | Discussion on simultaneous RxTx UE capability:  Observation 1: For TDD-FDD CA/EN-DC combinations, besides the combinations with mandatory simultaneous Rx/Tx operation, for combinations without any note indication, UE shall signals the capability if the UE does support simultaneous Rx/Tx based on its implementation, otherwise, if capability is not reported or absent, it means that the band combination does not support simultaneous Rx/Tx.  Observation 2: simultaneous Rx/Tx capability is not consistent for the band combinations in the spec for inter-band CA.  Observation 3: According to RAN2 spec, if the capability of the fallback mode is different from that of the higher order combination, the capability of fallback mode should be reported additionally. From the RAN2 spec, if the network considers the fallback mode simultaneous Rx/Tx capability as well to decide the UL/DL scheduling for the higher order band combination, this issue can be solved.  Observation 4: there is no obvious judgement that simultaneous Rx/Tx cannot be supported for the FDD-TDD band combination, which means UE shall report simultaneous Rx/Tx capability for all FDD-TDD two-band combinations by default unless otherwise indicated.  Observation 5: Indications of mandatory capability for a higher order band combination are not specified in a consistent and generic method.  **Proposal 1: If the simultaneous capability of the fallback mode is different from that of the higher order combination, the network shall also refer to the fallback mode capability to decide the UL/DL scheduling for the band combination. Some clarification may be needed in RAN2 specification. Draft LS should be sent to RAN2 for the clarification.**  **Proposal 2: For FDD-TDD CA/EN-DC band combinations, remove the indication of mandatory simultaneous Rx/Tx operation condition in the spec, instead, only indicate non-simultaneous Rx/Tx for the band combination if identified, and by default UE shall report simultaneous Rx/Tx capability for two-band FDD-TDD band combinations.**  **Proposal 3: The restriction note similar to non-simultaneous Tx/Rx operation should also be considered for fall back mode to support mandatory simultaneous Tx/Rx operation.**  **Proposal 4: Revise the Notes in the spec to make the capability consistent for all of the fall back and higher order combinations for TDD-TDD and TDD-FDD CA/EN-DC combinations.** |
| R4-2016472 | Huawei, HiSilicon | CR for TS 38.101-3 correction CR for simultaneous Tx/Rx operation (R15) |
| R4-2016473 | Huawei, HiSilicon | Mirror CR to R4-2016472 |
| R4-2016470 | Huawei, HiSilicon | CR for TS 38.101-1: correction CR for simultaneous Tx/Rx operation (R15)  Submitted to 4.2.1.1 |
| R4-2016471 | Huawei, HiSilicon | Mirror CR to R4-2016470  Submitted to 4.2.1.1 |
| R4-2015337 | OPPO | CR on simultaneous Tx-Rx for EN-DC  CatF R15  Coversheet error |
| R4-2015338 | OPPO | CR on simultaneous Tx-Rx for EN-DC (R16 mirror CR)  CatF R16 submitted to 7.19.3  Coversheet error |
| R4-2015016 | NTT DOCOMO | CR to TS 38.101-1[R15]: Clarification of non-simultaneous Rx/Tx operation for CA\_n77-n79 and CA\_n78-n79 in TS 38.101-1  Submitted to 4.2.1.2 |
| R4-2015017 | NTT DOCOMO | Mirror CR to R4-2015016  Submitted to 4.2.1.2 |
| R4-2016238 | Skyworks | CR 38101-3 R15 Band 10 protection and DC\_42\_n79 |
| R4-2016241 | Skyworks | Mirror CR to R4-2016238 |
| R4-2014917 | Apple | LS response on simultaneous Rx/Tx for inter-band NR-DC  Submitted to 16.2 |
| R4-2016001 | ZTE | Draft reply LS on simultaneous Rx/Tx for inter-band NR-DC  Submitted to 4.1 |

## Open issues summary

### Sub-topic 1-1

For certain Two-Band combos, specs specify that it is mandatory to support simultaneous Rx/Tx for the UE. It is ambiguous whether the UE is mandatory to support simultaneous Tx/Rx for the Two-Band combos with neither any specification of *simultaneous* nor *non-simultaneous* in the specs. It might be different between TDD-TDD and FDD-TDD combos but it is general for all CA, SUL and EN-DC.

**Issue 1-1: Whether the UE is mandatory to support simultaneous Rx/Tx on the Two-Band combos without any indication in the specs, generally for CA, SUL and EN-DC**

* For FDD-TDD combos
  + Option 1.1: If not indicated otherwise, the UE is mandatory to support simultaneous Rx/Tx on all FDD-TDD. This means that the UE needs to report simultaneous capability by default.
  + Option 1.2: if not indicated otherwise, no restrictions. This means that the UE is allowed to not report on any of the combos without case-by-case mandatory indication in the spec.
* For TDD-TDD combos
  + Option 2.1: if not indicated otherwise, no restrictions. This means that the UE is allowed to not report on any of the combos without case-by-case mandatory indication in the spec.
* Recommended WF
  + Discuss the above two issues; Agree on option 2.1 if no other voice is heard

### Sub-topic 1-2

It is ambiguous whether the fallback and higher-order combos have the same characteristics in terms of UE capability of simultaneous Rx/Tx. This is in general the case for all CA, SUL and EN-DC combos. Under the cases that the UE has different characteristics of supporting simultaneous Rx/Tx on the fallback and the higher-order combos (e.g., support under two-band combo but not support under higher-order), it has to report differently for both combos respectively. The network has to schedule/configure correspondingly. This may need RAN2 clarifications in the spec.

**Issue 1-2: How to consider whether the UE is mandatory to support simultaneous Rx/Tx for higher-order combos?**

* The UE is allowed to not report supporting simultaneous Rx/Tx for higher-order combos unless otherwise specified
  + Option 1.1: Yes. Under the cases that the UE has different characteristics of supporting simultaneous Rx/Tx on the fallback and the higher-order combos (e.g., support under two-band combo but not support under higher-order), it has to report differently for both combos respectively.
* Whether an LS is needed to RAN2?
  + Option 2.1: Yes. RAN2 may need to clarify that the network needs to be aware of the possible differences between fallback and higher-order combos in terms of UE supporting simultaneous Rx/Tx operation.
* Recommended WF
  + Discuss and agree on the issue; send LS to RAN2 if needed

### Sub-topic 1-3

Following sub-topic 1-2, the issues for CA\_n77-n79 and CA\_n78-n79 are that: it is not clear whether the higher-order combos also have the same restrictions.

**Issue 1-3: the issues of CA\_n77-n79 and CA\_n78-n79 higher-order combos**

* Higher-order combos of CA\_n78-n79 also have the restriction that simultaneous Rx/Tx capability is not reported if UE is using n77 implementation for n78
  + Option 1.1: Yes
  + Option 1.2: No. case by case discussion is needed
* CA\_n77-n79 and its higher-order combos have the restriction that the minimum requirements apply only when there is non-simultaneous Rx/Tx between n77 and n79
  + Option 1.1: Yes
  + Option 1.2: No. case by case discussion is needed
* Recommended WF
  + Discuss on the above issues considering the outcome of sub-topic 1-2

### Sub-topic 1-4

R4-2016238 from skyworks proposes two corrections: 1) remove EUTRA band 10 protection; 2) clarify that it is not feasible for n77 implementation to support simultaneous Rx/Tx on DC\_42\_n79.

**Issue 1-4: Whether the CR can be agreed**

* Band 10 correction
  + Option 1.1: agreeable
* Simultaneous Rx/Tx on DC\_42\_n79 correction
  + Option 2.1: agreeable
  + Option 2.2: not agreeable
* Recommended WF
  + Discuss if the CR is agreeable

### Sub-topic 1-5

Ran2 sent an LS in R4-2014159 asking for guideline on whether simultaneous RxTx UE capability is needed for inter-band NR-DC. We understand that the Rx/Tx simultaneous capability issue discussed for CA, SUL and EN-DC combos also applies for NR DC.

**Issue 1-5: An reply LS needs to be sent to RAN2 about RAN4 consensus on UE capability of Rx/Tx simultaneous operation on NR DC combos**

* NR DC UE capability follows any specifications for the corresponding combo of NR CA
  + Option 1.1: Yes
* Recommended WF
  + Agree on the above proposal and send LS to RAN2; One LS can cover conclusions from both sub-topic 1-2 and 1-5

## Companies views’ collection for 1st round

### Open issues

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| **Sub-topics** | **Comments** |
| Issue 1-1:  Whether the UE is mandatory to support simultaneous Rx/Tx on the Two-Band combos without any indication in the specs, generally for CA, SUL and EN-DC? | Company 1:  Company 2:  ….  [OPPO] Option 1.2 for FDD-TDD, Option 2.1 for TDD-TDD, i.e. should be optional support simultaneous Rx/Tx if no mandatory indication in the spec.  According to 38.306, the capability ***simultaneousRxTxInterBandENDC*** is defined to indicate whether UE supports simultaneous transmission and reception in TDD-TDD and TDD-FDD, and it further clarified that the mandatory combinations are clearly specified in 38.101-3. We can see that if one band combination is mandatory then it should be specified explicitly in the spec, if no explicit indication then this band combination can report whether it supports simultaneousRxTx via this capability report.   |  | | --- | | ***simultaneousRxTxInterBandENDC***  Indicates whether the UE supports simultaneous transmission and reception in TDD-TDD and TDD-FDD inter-band (NG)EN-DC/NE-DC. It is mandatory for certain TDD-FDD and TDD-TDD band combinations defined in TS 38.101-3 [4]. |   ZTE: In 38.306, there are three capability signaling introduced simultaneousRxTxInterBandCA, simultaneousRxTxSUL, simultaneousRxTxInterBandENDC for CA, SUL and EN-DC respectively.  *simultaneousRxTxInterBandCA*  *Indicates whether the UE supports simultaneous transmission and reception in TDD-TDD and TDD-FDD inter-band NR CA. It is mandatory for certain TDD-FDD and TDD-TDD band combinations defined in TS 38.101-1 [2], TS 38.101-2 [3] and TS 38.101-3 [4].*  *simultaneousRxTxSUL*  *Indicates whether the UE supports simultaneous reception and transmission for a NR band combination including SUL. Mandatory/Optional support depends on band combination and captured in TS 38.101-1 [2].*  So for FDD-TDD combos, Option 1.2 looks more aligned with 38.306. And similarly for TDD-TDD combos, Option 2.1.  Ericsson:  For FDD-TDD combinations, Option 1.1. If simultaneousRxTx is supported for a BC this shall be reported for the BC regardless if requirement is mandatory for the said BC. If the requirements for a particular BC do not apply for simultaneousRxTx, then this is noted in the RAN4 tables.  For TDD-TDD combinations, the same should apply.  The most important thing is that the network must be able to understand what UE can and cannot do for a BC by looking at the capability IEs itself. The network should be not be forced to implement any RAN4 tables with information about capabilities (including information in footnotes).  Skyworks: regarding TDD-TDD there are case without specific note on supporting simultaneous Tx/Rx like for DC\_42\_n42. Even if it is agree that it means that the support is optional or mandatory it must have a complete requirement: i.e. all issue generated by simultaneous Tx/Rx should be specified especially interference due to UL. In our CR we add the missing MSD for this case. also it cannot be supported for implementation using a n77 filter for B42. This is to explain that one should very carefully check all possible issues before choosing to allow simultaneous Tx/Rx whether mandatory or optional. This is also the case for FDD-TDD.For TDD-TDD we are OK with no indication means optional whether simultaneous Tx/Rx is supported but other notes may be needed and all requirements related to simultaneous Tx/Rx should be in place.  Qualcomm:  Choose option 1.2 for FDD+TDD and option 2.1 for TDD+TDD. Optional by default unless explicitly stated case by case. Release 15 UEs already in field may not have mandatory support indicated for some combos, so those UEs in the field already will not be able to indicate optional for some combinations |
| Issue 1-2:  How to consider whether the UE is mandatory to support simultaneous Rx/Tx for higher-order combos? | [OPPO] Agree with option 1.1. The *simultaneousRxTxInterBandENDC* capability is a per-band combination capability that means UE can report different simultaneous Rx/Tx capability between higher or lower band combinations.  No strong view whether an LS is sent to RAN2, but actually RAN2 current signaling is enough and no more thing needs to be done in RAN2.  ZTE: Currently, for FR1+FR1 UL inter-band NR CA, CC is only for 2, which is each CC for each band. So if the ‘high order’ is in terms of number of DL CC, then high order configuration share the same characteristics with lower order configuration. If “higher order” is in terms of number of bands, not CCs, we still think high order configuration share the same characteristics with lower order configuration on the same bands.  For LS to RAN2, this can be included in the same reply LS.  Ericsson:  Option 1.1. If the fallback BC supports simultaneousRxTx but not the higher order “parent” BC does not, then both BC *can* be reported. The specification does not mandate the UE to include capabilities for optional features, i.e. list fallback BCs explicitly to advertise some additional features of the fallbacks. The spec only defines the BC/FS the UE shall not signal explicitly.  RAN2 is aware of the above, but an LS could be sent to RAN2 if changes or clarifications are needed in the RAN2 specifications, e.g. that absence of the field simultaneousRxTx means that the capability is not supported for a BC.  Skyworks: if simultaneous Tx/Rx is not supported in fallback it should not be supported for the higher order when using the corresponding UL configuration. Again the key is that the simultaneous Tx/Rx operation is clear including with additional TDD bands and potential requirements are in place and signaling is done accordingly  Qualcomm:  Mandatory or optional for higher order combinations must be looked at case by case. |
| Issue 1-3:  the issues of CA\_n77-n79 and CA\_n78-n79 higher-order combos | [OPPO] Clarification is needed what is the “higher-order combinations”, is it only these two bands with more intra-band CC or is it inter-band combinations with other bands. In general, our understanding is case by case discussion is needed if UE is required to mandatory support.  ZTE: Option 1.1. yes. We think high order configuration share the same characteristics with lower order configuration. Also In TS38.101-1, there is a note for CA\_n78-n79, which is : Simultaneous Rx/Tx capability does not apply for UEs supporting band n78 with a n77 implementation.  Ericsson: the issue is somewhat unclear, possibly Option 1.1. The RAN4 requirements should not be conditioned on implementations, but a mandatory simultaneousRxTx requirement (if relevant for DC\_42-n78) could be waived for a UE also supporting Band n77. The UE shall report the simultaneousRxTx according to its capability for each BC indicated (in the lists of supported band combinations)  Skyworks: CA\_n77-n79 cannot support simulataneous Tx/Rx due to small band separation (at least without a massive MSD that is not specified). For CA\_n78-n79 simultaneous Tx/Rx is possible with MSD (specified) but under the assumption that a dedicated n78 filter is used. Thus simultaneous Tx/Rx should not be allowed for CA\_n78-n79 using a band n77 implementation to support n78 and this is valid for higher order combinations (whether intra and/or inter) when this UL configuration is used. Whatever is signalled or not the UE behavior is not specified in this particular case.  So CA\_n77-n79 requirements only apply for non-simultaneous Tx/Rx (ie the MSD for simultaneous Tx/Rx is not part of the minimum requirement). Answer is yes to both questions.  Qualcomm:  Yes, to apply restriction for CA\_n77\_n79 and CA\_n78\_n79 to higher order combinations. |
| Issue 1-4:  Whether the CR can be agreed | [OPPO] CR is ok.  ZTE: For simultaneous Rx/Tx on DC\_42\_n79 correction, isn’t need to define the MSD for band 41 -> band n79 due to the cross band isolation?  Ericsson: for 2) the specification should not state what is feasible or not with a particular UE implementation. A requirement for CA\_42-n79 could apply for non-simultaneousRxTx in case the UE also supports n77.  Skyworks: For DC\_42\_n79 the minimum requirement for simultaneous Tx/RX was completely missing or based on implementation using a dedicated Band 42 filter. Even in LTE this is not the assumption for the minimum requirement. we added the MSD for crossband isolation based on a implementation using a n78 dedicated filter. Which is the only way to diplex the bands because an n77 filter would not even reduce n79 UL to a level acceptable to the band 42 receiver.  To ZTE: DC\_42\_n79 has an extra note that there is no UL in band 42 and that this combination is only used for higher order combinations (see Note 9). Thus only n79 UL should be considered  Qualcomm:  Option 1.1 remove Band 10- agreeable. DC\_42\_n79 Agreeable but revise note to include requirement if 2 band combination is part of higher order band combination. |
| Issue 1-5:  NR DC UE capability follows any specifications for the corresponding combo of NR CA? | [OPPO] Option 1.1, yes.  ZTE: Yes, same view as in our draft reply LS.  Ericsson: Option 1.1.  Skyworks: agree capability is needed for NR DC too. |
| Others: |  |

### CRs/TPs comments collection

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| **CR/TP number** | **Comments collection** |
| R4-2016472  R4-2016473 | [OPPO] Regarding “*Unless otherwise indicated, all two-band TDD-FDD inter-band NR CA, SUL or inter-band EN-DC configurations shall report the simultaneousRxTx capability*”, our understanding is that unless otherwise indicated the simultaneousRxTx is optionally support.  Regarding mandatory report the simultaneousRxTx capability if the band combination is a mandatory simultaneous RxTx band combination or UE support simultaneous RxTx, for clarification is there a UE support simultaneous RxTx but do not report the capability?  ZTE: For the new added sentence, we think what is reported depends on RAN2, it dosen't belong to the minimum requirement in RAN4 |
| Ericsson: this CR should be revised.  This effort to clarify the simultaneousRXTx applicability and capability reporting is good and appreciated. We agree with the gist of the changes.  General clause: the new item e) should state that the "requirements apply for simultaneousRxTx unless otherwise stated" or similar. The reporting behavior belong to RAN2 specifications, not in RAN4 specifications. Clause 5.5B: the statement "This capability applies also for these carriers when applicable EN-DC configuration is part of a higher order EN-DC configuration." suggests the UE should also report the lower-order BC if its capability is different. This is not mandated but the UE can do it. It is essential that the UE report the simultaneousRxTx capability for each BC indicated (fallback and parent if both are reported in the supported band combinations). Absence of the capability/field for the BC indicated should mean that simultaneousRxTx is not supported. |
| Qualcomm: Cannot agree to CR |
| R4-2016470  R4-2016471 | [OPPO] Same comment as R4-2016472.  ZTE: Same comments as above. |
| Ericsson: this CR should be revised, see comments to R4-2016472. |
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| R4-2015337  R4-2015338 | ZTE: see issue 1-1. |
| Ericsson: not agreed, requirements for simultaneousRxTX should be mandatory unless otherwise stated. If mandatory for a BC, then the UE must report simultaneousRxTX for the said BC |
| To Ericsson: this CR is exactly doing this: it states for which case the simultaneous Tx/RX can be supported with the associated requirements. This exactly what has been agreed for CA\_n78-n79 and unless agreed then this combination should not be allowed for simultaneous Tx/Rx at all |
| R4-2015016  R4-2015017 | ZTE: Currently, MSD due to cross band isolation are defined for CA\_n78-n79 for UEs supporting inter-band carrier aggregation with simultaneous Rx/Tx capability. we are not sure why such requirements were not defined for CA\_n77-n78 due to same as CA\_n78-n79 |
| Ericsson: not agreed. NOTE 3 is odd, the requirements could apply for non-simultaneousRxTx if the UE also supports n77 (then n78 is possibly implemented by n77). |
| Skyworks: We support the CR as it is only was is supported by the current specification and need for the operators deployment  Note that for all this discussion it is not possible to even operate collocated n77 and n79 networks with simultaneous Tx/Rx in Japan and only in regions/locations where only n78 portion of n77 is in operation then n78 and n79 can be operated with simultaneous Tx/Rx provided the the use of dedicated filter which is not the baseline or WW implementation.  To ZTE CA\_n77-n78 is intra band since the two band overlap. |
| R4-2016238  R4-2016241 | Qualcomm: Need to revise CR to account for higher order combinations |
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| R4-2014917 |  |
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| R4-2016001 |  |
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## Summary for 1st round

### Open issues

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

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

*Recommendations on WF/LS assignment*

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|  | **WF/LS t-doc Title** | **Assigned Company,**  **WF or LS lead** |
| #1 |  |  |

### CRs/TPs

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

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| **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)

## Summary on 2nd round (if applicable)

*Moderator tries to summarize discussion status for 2nd round and provided recommendation on CRs/TPs/WFs/LSs Status update suggestion*

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| **CR/TP/LS/WF number** | **T-doc Status update recommendation** |
| XXX | *Based on 2nd round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

# Topic #2: Receiver requirements

Receiver requirements corrections are covered in Topic #2. Please see the below details. The moderator uses colours for mapping between papers/proposals and sub-topics.

## Companies’ contributions summary

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| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2014165 | Qualcomm | CR CatF Cross Band Noise DC\_1\_n40\_highBW |
| R4-2014166 | Qualcomm | CR CatA Cross Band Noise DC\_1\_n40\_hignBW  Uploaded |
| R4-2014682 | Anritsu, Apple | UL output power for spurious response and general Rx |
| R4-2014683 | Anritsu, Apple | Mirror CR to R4-2014682 |
| R4-2015796 | KDDI | CR to correct MSD of DC\_1A-41A\_n77A&n78A  CatF R15 |
| R4-2015797 | KDDI | CR to correct MSD of DC\_1A-41A\_n77A&n78A  CatF R16 submitted to 7.19.3 |
| R4-2016085 | VODAFONE | CR to 38.101-3 DC\_1A-20A\_n28A Missing MSD  CatF R15 |
| R4-2016087 | VODAFONE | CR to 38.101-3 DC\_1A-20A\_n28A Missing MSD (Rel-16)  CatA R16 submitted to 7.5.1 |
| R4-2016225 | vivo | CR to TS38.101-3[R15] Applicability of 2Rx requirements |
| R4-2015226 | vivo | Mirror CR to R4-2016226 |

## Open issues summary

Mainly maintenance CRs.

### Sub-topic 2-1

R4-2014165 and its mirror CR add a NOTE 4 in uplink config table for REFSENS exception due to cross band isolation. The note says for 80MHz UL bandwidth on band n40, the RBs are located at position 15.

**Issue 2-1: Agree on R4-2014165?**

* Proposals
  + Option 1: Yes
  + Option 2: No
* Recommended WF
  + Discussion is needed

### Sub-topic 2-2

R4-2014682 corrects the UL power levels for spurious responses. The same corrections were agreed for OOBB in the last meeting. It also corrects a few errors in referring section numbers.

**Issue 2-2: Agree on R4-2014682?**

* Proposals
  + Option 1: Yes
* Recommended WF
  + Agree on R4-2014682 and its mirror CR

### Sub-topic 2-3

R4-2015796 and its mirror CR correct the testing points for DC\_1A-41A\_n77A and DC\_1A-41A\_n78A.

**Issue 2-3: Agree on R4-2015796?**

* Proposals
  + Option 1: Yes
* Recommended WF
  + Agree on R4-2015796 and its mirror CR

### Sub-topic 2-4

R4-2016085 adds IMD5 test points for DC\_1A-20A\_n28A for DC\_20A\_n28A interfering band 1 DL. The value is proposed as 8.9dB MSD.

**Issue 2-4: Agree on R4-2016085?**

* Proposals
  + Option 1: Yes
* Recommended WF
  + Agree on R4-2016085 and ask for a tdoc mirror CR

### Sub-topic 2-5

R4-2016225 clarifies in EN-DC spec that for the Rx requirements the UE is only tested with 4 antenna ports when it claims 4 antenna port on a certain band. Similar corrections were agreed for NR CA in the last meeting.

**Issue 2-5: Agree on R4-2016225?**

* Proposals
  + Option 1: Yes
* Recommended WF
  + Agree on R4-2016225 and its mirror CR

## Companies views’ collection for 1st round

### Open issues

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| **Sub-topics** | **Comments** |
| Issue 2-1:  Agree on R4-2014165 | ZTE: We support this approach. However,it seems the note is not clear. what does 'RB position' mean? is it located from low egde or upper edge? Also is the note 2 still available?  Ericsson: is this 15 RB shift needed for a particular filter implementation? Another note: Note 1, Note 3 and Note 4 do not seem to be compatible, by Note 1 the TDD allocation should be within the BW (the maximum transmission bandwidth configuration per CBW), by Note 3 the 100 PRB for 80 MHz should be configured within a 20 MHz carrier -- where within the 80 MHz block? By Note 4 the 100 PRB shall be shifted by 15 PRB, but then does not fit within a 20 MHz bandwidth.  Skyworks: we understand the concept and the note but we assume the UL channel in B40 is still placed at the closest edge to band 1 and thus this shift changes the IMD order falling in band 1.  Qualcomm: This paper should be moved to thread [116] sub-topic 3.2.1.  This is actually RB start = 15 for SCS=30KHz. The syntax is duplicated from TS36.101. so Note 3 says you use minimum supported SCS for the UL configuration and for 80MHz, it is 30KHz SCS. The RB start is modified from 0 to 15. |
| Issue 2-2:  Agree on R4-2014682? | Skyworks: we have followed the discussion since last meeting and agree this CR represents the consensus |
| Issue 2-3:  Agree on R4-2015796? | ZTE:No strong view. But we would like to ask a question, why N/A is defined in MSD table for this configuration in Rel-15? (N/A means no MSD need to be defined)  Skyworks: Support introduction of MSD |
| Issue 2-4:  Agree on R4-2016085? | Skyworks: we recognize the missing MSD and support the proposed CR |
| Issue 2-5:  Agree on R4-2016225? | Ericsson: this change was apparently agreed for SA, but is this statement relevant in a RAN4 specifications? (The scope of conformance verification belongs to the conformance test specification.)  vivo: response to E///, thanks for the comments. yes, this is the applicability of RAN4 core requirements, which should be stated in the RAN4 spec. Besides, as you said, this is aligned with SA 2Rx requirements applicability rule. Aligned conclusions captured in 101-1 and 101-3 would be beneficial to develop high quality RAN4 specs. |
| Others: |  |

### CRs/TPs comments collection

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| **CR/TP number** | **Comments collection** |
| R4-2014165  R4-2014166 | Ericsson: see comments to issue 2-1. |
| Company B |
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| R4-2014682  R4-2014683 |  |
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| R4-2015796  R4-2015797 |  |
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| R4-2016085  R4-2016087 |  |
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| R4-2016225  R4-2015226 |  |
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## Summary for 1st round

### Open issues

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

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

*Suggestion on WF/LS assignment*

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|  | **WF/LS t-doc Title** | **Assigned Company,**  **WF or LS lead** |
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### CRs/TPs

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

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| **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)

## Summary on 2nd round (if applicable)

*Moderator tries to summarize discussion status for 2nd round and provided recommendation on CRs/TPs/WFs/LSs Status update suggestion*

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| **CR/TP/LS/WF number** | **T-doc Status update recommendation** |
| XXX | *Based on 2nd round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

# Topic #3: Transmitter requirements

Transmitter requirements corrections are covered in Topic #3. Please see the below details. The moderator uses colours for mapping between papers/proposals and sub-topics.

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2014309 | SoftBank | Clarification of additional spurious emission requirements on Inter-band EN-DC(R15)  CatF |
| R4-2014310 | SoftBank | Clarification of additional spurious emission requirements on Inter-band EN-DC(R16)  CatA uploaded |
| R4-2014900 | Apple | Coexistence cleanup for 38.101-3 Rel15  CatF |
| R4-2014901 | Apple | Coexistence cleanup for 38.101-3 Rel16  CatF submitted to 7.19.3 |
| R4-2016496 | Huawei, HiSilicon | CR for TS 38.101-3: correction of spurious emission band UE co-existence (R15)  CatF |
| R4-2016497 | Huawei, HiSilicon | CR for TS 38.101-3: correction of spurious emission band UE co-existence (R16)  CatF |
| R4-2015805 | ETSI MCC | Correction of CR0325 implementation |
| R4-2016054 | Ericsson | Correction of p-Max I.E and corresponding references  R16 CatA uploaded  Coversheet error |
| R4-2016055 | Ericsson | Correction of p-Max I.E and corresponding references  R15 CatF  Coversheet error |
| R4-2016485 | Huawei, HiSilicon | CR for 38.101-3 Correction on EN-DC synchronous carriers (R15) |
| R4-2016486 | Huawei, HiSilicon | Mirror CR to R4-2016485 |
| R4-2016492 | Huawei, HiSilicon | CR for TS 38.101-3: correction of delta Tib for UE supporting multiple band combinations (R15) |
| R4-2016493 | Huawei, HiSilicon | Mirror CR to R4-2016492 |
| R4-2016482 | Huawei, HiSilicon | CR for TS 38.101-3: correction of power class for EN-DC  Moved to [115] |
| R4-2016498 | Huawei, HiSilicon | CR for TS 38.101-3: Adding delta TIB requirement for DC\_2-7-7-13\_n66 (R16)  Moved to [116] |
| R4-2016595 | Huawei, HiSilicon | Withdrawn? |
| R4-2015992 | CHTTL | CR to TS 38.101-3 clarifications on indication of Single Uplink allowed for intra-band EN-DC and NE-DC  Moved to topic #4 |
| R4-2015999 | CHTTL | Mirror CR to R4-2015992  Moved to topic #4 |

## Open issues summary

Mainly maintenance CRs.

### Sub-topic 3-1

It is proposed in R4-2014309 that *Unless otherwise stated, for inter-band EN-DC with uplink assigned to one LTE band and one NR band, the requirements for additional spurious emissions apply when one of the bands in a combination is subject to an additional spurious emission requirement (i.e. in clause 6.6.3.3 of TS36.101[4] or clause 6.5.3.3 of TS38.101-1[2]) and the other band shall also protect the same band or range in the spurious emission for UE co-existence requirement (i.e. in clause 6.6.3.2 of TS36.101[4] or clause 6.5.3.2 of TS38.101-1[2]), with the indication of the relevant network signalling(NS) in the former band.*

**Issue 3-1: EN-DC UE has to meet additional single band spurious emission requirements (signalled by NS\_X) on both ULs?**

* Proposals
  + Option 1: Yes
  + Option 2: No
* Recommended WF
  + Discussion is needed

### Sub-topic 3-2

Coexistence cleanup CRs are submitted in 4900 4901 6496 6497.

**Issue 3-2: How to handle the CRs?**

* Check the contents in all CRs and agree on only one sets: one for R15 and one for R16
  + Option 1: Yes
* Recommended WF
  + Merge all into one set.

### Sub-topic 3-3

R4-2015805 is from MCC.

**Issue 3-3: Agree on R4-2015805?**

* Proposals
  + Option 1: Yes
* Recommended WF
  + Agree on R4-2015805

### Sub-topic 3-4

R4-2016055 corrects reference number errors.

**Issue 3-4: Agree on R4-2016055?**

* Proposals
  + Option 1: Yes
* Recommended WF
  + Agree on R4-2016055 and its mirror CR

### ~~Sub-topic 3-5~~

~~R4-2016482 corrects configured powers by adding clarifications on deltaPpowerclass,nr. Only Rel-15 needs to be corrected since UE is not able to report the corresponding capability.~~

**~~Issue 3-5: Agree on R4-2016225?~~**

* ~~Proposals~~
  + ~~Option 1: Yes~~
* ~~Recommended WF~~
  + ~~Agree on R4-2016482~~

### Sub-topic 3-6

R4-2016485 further clarifies that the requirements specified for DC\_20A\_n28A apply when the two bands are collocated-deployed.

**Issue 3-6: Agree on R4-2016485?**

* Proposals
  + Option 1: Yes
* Recommended WF
  + Agree on R4-2016485 and its mirror CR

### Sub-topic 3-7

For UE supporting multiple band combinations, ∆TIB,c could be different for these combinations. Unlike ∆RIB,c , how to use ∆TIB,c in this case is not clearly specified. R4-2016492 proposes to clarify this issue. When the operating band frequency range is ≤ 1 GHz, the applicable additional ∆TIB,c shall be the average value for all band combinations; When the operating band frequency range is > 1 GHz, the applicable additional ∆TIB,c shall be the maximum value for all band combinations.

**Issue 3-7: Agree on R4-2016492?**

* Proposals
  + Option 1: Yes
* Recommended WF
  + Agree on R4-2016492 and its mirror CR

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| **Sub-topics** | **Comments** |
| Issue 3-1:  EN-DC UE has to meet additional single band spurious emission requirements (signalled by NS\_X) on both ULs? | Company 1:  Company 2:  ….  [OPPO] Option 1: Yes  Ericsson: yes, additional requirements are often regulatory.  Skyworks: agree  Qualcomm: The NS should be signaled in both cell groups. Why wouldn’t that be the case? The UE should not assume it applies to both cell groups if only signaled in one |
| Issue 3-2:  How to handle the CRs? |  |
| Issue 3-3:  Agree on R4-2015805? | Skyworks: should be agreeable  Qualcomm: Yes, agree CR |
| Issue 3-4:  Agree on R4-2016055? |  |
| ~~Issue 3-5:~~  ~~Agree on R4-2016055?~~ |  |
| Issue 3-6:  Agree on R4-2016485? | [OPPO] No strong view. The note content itself is ok, but not sure whether this kind of note is necessary or not in the spec.  [Nokia] This issue has been discussed already and has not been agreeable. UE specification should not have network deployment aspects.  Ericsson: not agreed. However, the issue of supporting requirements relevant for non-collocated deployment in similar cases with overlapping DLs should be addressed.  Skyworks: at least the UE behavior in non-co-located scenario is unknown as some or all of the receive AGC may not have the proper setting for both carriers but existing notes should be sufficient  Qualcomm: Note 10 and 11 are sufficient to define requirements for this band combination. It is unnecessary and redundant to add Note 12 as there is no added clarification. Also, deployment scenario should not be stated in the RF specification. Specific requirements are already defined. |
| Issue 3-7:  Agree on R4-2016492? | ZTE: We feel a bit confusion for this new added sentence, maybe some examples can be further clarified. In addition, why different approach are used for <=1GHz and >1 GHz?  Qualcomm: The original motivation to distinguish <1 GHz and >1 GHz was because the relaxation applies to the corresponding UTRA band. If that’s no longer the case, then the distinction may not be needed either. |
| Others: |  |

### CRs/TPs comments collection

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| R4-2014309  R4-2014310 | Company A |
| Company B |
|  |
| R4-2014900  R4-2014901 | [Nokia] for DC\_12\_n66 can E-UTRA bands 42 and 43 be moved to first row as there is no note? |
|  |
|  |
| R4-2016496  R4-2016497 |  |
|  |
|  |
| R4-2015805 |  |
|  |
|  |
| R4-2016054  R4-2016055 |  |
|  |
|  |
| ~~R4-2016482~~ |  |
|  |
|  |
| R4-2016485  R4-2016486 | [Nokia] This issue has been discussed already and has not been agreeable. UE specification should not have network deployment aspects. |
| Ericsson: not agree (but see comment on issue 3-6) |
| Qualcomm: Cannot agree to CR |
| R4-2016492  R4-2016493 | ZTE: We feel a bit confusion for this new added sentence, maybe some examples can be further clarified. In addition, why different approach are used for <=1GHz and >1 GHz? |
|  |
|  |

## 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:* |

*Suggestion on WF/LS assignment*

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|  | **WF/LS t-doc Title** | **Assigned Company,**  **WF or LS lead** |
| #1 |  |  |

### 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)

## Summary on 2nd round (if applicable)

*Moderator tries to summarize discussion status for 2nd round and provided recommendation on CRs/TPs/WFs/LSs Status update suggestion*

|  |  |
| --- | --- |
| **CR/TP/LS/WF number** | **T-doc Status update recommendation** |
| XXX | *Based on 2nd round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

# Topic #4: Others

Several other issues are covered in Topic #4. Please see the below details. The moderator uses colours for mapping between papers/proposals and sub-topics.

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2014914 | Apple | CR for TS 38.101-3: Corrections for intra-band contiguous EN-DC configurations  CatF R15 |
| R4-2014915 | Apple | CR for TS 38.101-3: Corrections for intra-band contiguous EN-DC configurations  CatF R16 submitted to 7.19.3 |
| R4-2015034 | ZTE | CR to TS 38.101-3: Some corrections on the ENDC |
| R4-2015035 | ZTE | Mirror CR to R4-2015034 |
| R4-2015992 | CHTTL | CR to TS 38.101-3 clarifications on indication of Single Uplink allowed for intra-band EN-DC and NE-DC |
| R4-2015999 | CHTTL | Mirror CR to R4-2015992 |

## Open issues summary

Mainly maintenance CRs.

### Sub-topic 4-1

Correct intra-band EN-DC configurations*.*

**Issue 4-1: Agree on R4-2014914?**

* Proposals
  + Option 1: Yes
* Recommended WF
  + Agree on R4-2014914

### Sub-topic 4-2

R4-2015034 proposes mainly to clarify that for EN-DC with FR2, suffix D requirements do not apply. Also it proposes to change each CC to individual sub-block for intraband NC EN-DC SEM.

**Issue 4-2: Agree on the changes in R4-2015034?**

* Agree on removal of suffix D references in TS 38101-2.
  + Option 1.1: Yes
* Agree on the wording changes on SEM intraband NC EN-DC
  + Option 2.1: Yes
  + Option 2.2: No. needs discussion.
* Recommended WF
  + Discuss and revise if needed

### Sub-topic 4-3

For the intra-band EN-DC and NE-DC combinations, as the indication of single UL allowed is due to potential emission issues, there is no need to check whether the IM2 or IM3 falls into own primary downlink channel bandwidth or not when determining dual uplink is mandatory support or not. The description for the equation of the self IM interference includes the intra-band configuration tables in the current specification, which might cause confusion.

**Issue 4-3: Agree on R4-2015992?**

* Proposals
  + Option 1: Yes
* Recommended WF
  + Agree on R4-2015992 and its mirror CR

### Sub-topic 4-4

As the proponent sees some ambiguity in the definition of *intraBandENDC-Support*, it is proposed in R4-2015089 to have some clarifications in RAN4 and ask RAN2 to incorporate the RAN4 consensus.

**Issue 4-4: clarify this ambiguity spotted in R4-2015089?**

* RAN4 clarifies the ambiguity raised in the paper in Rel-16
  + Option 1: Yes
  + Option 2: No
* If yes, in which way?
  + Option 1: Contiguous EN-DC or non-contiguous EN-DC is based on whether the configuration is included the Table 5.3B.1.2-1 or Table 5.3B.1.3-1.
    - Although non-contiguous uplink is included in Table 5.3B.1.2-1, they shall be supported by UE capable only of intra-band contiguous EN-DC.
  + Option 2: Clarify the definition of intraBandENDC-Support such that this is only related the adjacent LTE and NR carriers
    - This option is the first interpretation described above. If the adjacent LTE and NR carriers are contiguous according to the channel spacing criteria in TS 38.101-3, UE support such configuration, even if LTE part or NR part includes non-contiguous sub-blocks.
    - UE can support the configuration of contiguous downlink and non-contiguous uplink, only if UE signals the support of both contiguous EN-DC and non-contiguous EN-DC.
  + Option 3: Clarify the definition of intraBandENDC-Support such that all the carriers shall be contiguously spaced to be a contiguous EN-DC, otherwise, its non-contiguous.
    - This option is the second interpretation described above. Only if all the LTE and NR carriers are contiguously spaced according to the channel spacing criteria in TS 36.101, TS 38.101-1, and TS 38.101-3, then, UE capable of contiguous EN-DC can supports such configuration.
    - UE can support the configuration of contiguous downlink and non-contiguous uplink, only if UE signals the support of both contiguous EN-DC and non-contiguous EN-DC.
  + Option 4: Restructure UE capability signaling.
    - If none of the solutions (option 1-3) works well, revision of UE capability signaling structure can be further discussed.
  + Option 5: other options.
* Recommended WF
  + Discussion is needed

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| **Sub-topics** | **Comments** |
| Issue 4-1:  Agree on R4-2014914? | Company 1:  Company 2:  …. |
| Issue 4-2:  Agree on the changes in R4-2015034? | ZTE: Agree.  Qualcomm:  (On D-suffix removal)  For Rel-15: It would be better to add wording ‘…and for NR single carrier, ~~and~~ CA operation *and UL MIMO* operation specified in clause 6.3 of…’ Removal, as proposed, means precluding UL MIMO operation in ENDC.  For Rel-16 and newer: It is better to take out references to specific sub-clauses to allow for graceful growth in the future to include NRU, etc. If not removed, it would become necessary to string all the subclauses of applicable requirements. |
| Issue 4-3:  Agree on R4-2015992? | [OPPO] ok with the clarification.  Ericsson: not agreed, the IMD requirements are only waived for UEs actually indicating "singleUL-transmissions" (otherwise the requirements apply).  Qualcomm: Listing out the tables is a good change. But the wording about the reason for single UL allowed doesn’t seem to be needed. Maybe instead a note could be added to the table, similar to the Note 3 and Note 4 for the intra-band table? |
| Issue 4-4:  clarify this ambiguity spotted in R4-2015089? |  |
| Others: |  |

### CRs/TPs comments collection

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| R4-2014914  R4-2014915 | Company A |
| Company B |
|  |
| R4-2015034  R4-2015035 |  |
|  |
|  |
| R4-2015992  R4-2015999 | Ericsson: not agreed, see comment to issue 2-3. |
|  |
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## Summary for 1st round

### Open issues

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

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

*Suggestion on WF/LS assignment*

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|  | **WF/LS t-doc Title** | **Assigned Company,**  **WF or LS lead** |
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### CRs/TPs

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

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| **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)

## Summary on 2nd round (if applicable)

*Moderator tries to summarize discussion status for 2nd round and provided recommendation on CRs/TPs/WFs/LSs Status update suggestion*

|  |  |
| --- | --- |
| **CR/TP/LS/WF number** | **T-doc Status update recommendation** |
| XXX | *Based on 2nd round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |