**3GPP TSG-RAN WG4 Meeting #102-e R4-21XXXXX**

**Electronic Meeting, Feb 21- Mar 03, 2022**

**Agenda item:** 10.3.1, 10.3.2

**Source:** Moderator (Huawei, HiSilicon)

**Title:** Email discussion summary for [102-e][124] NR\_RF\_FR1\_enh\_IntraHPUE

**Document for:** Information

# Introduction

Thread [124] includes following topics:

1. Topic #1: Clarification of dualPA-architecture capability
2. Topic #2: PC2 Intra-band NC UL CA 1CC fallback
3. Topic #3: Solution for SCell dropping
4. Topic #4: Others (endorsed CRs in last meeting)

# Topic #1: Clarification of dualPA-architecture capability

## Companies’ contributions summary

|  |  |  |  |
| --- | --- | --- | --- |
| **T-doc number** | **T-doc name** | **Company** | **Proposals / Observations** |
| [**R4-2204827**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_102-e/Docs/R4-2204827.zip) | R17 FR1 clarification of dualPA-architecture capability | OPPO | ***Observation 1: dualPA-Architecture capability was introduced in Rel-15 to indicate whether this UE has one PA or two PAs to support the whole intra-band UL CA and doesn’t mention about the LO.***  ***Observation 2: In Rel-17 intra-band UL CA requirement definition, dualPA-Architecture capability was referred to indicate that this UE has two LO.***  ***Proposal 1: It is proposed to send LS to clarify in RAN2 38.306 that this capability is also used to indicate UE using two LO to support one intra-band UL CA.*** |

## Open issues summary

### Sub-topic 1-1: clarification in RAN2 spec for *dualPA-Architecture* capability

***Proposal: send LS to clarify in RAN2 38.306 that this capability is also used to indicate UE using two LO to support one intra-band UL CA.***

| ***dualPA-Architecture***  For band combinations with single-band with UL CA, this field indicates the support of dual PA and dual LO. If absent in such band combinations, the UE supports single PA and single LO for all the ULs. For other band combinations, this field is not applicable. | BC | No | N/A | N/A |
| --- | --- | --- | --- | --- |

***Moderator’s recommendation:***

* Recommended WF
  + Check whether the draft LS is agreeable

|  |  |
| --- | --- |
| **Company** | **Comments** |
| OPPO | Support the LS.  dualPA-Architecture capability was introduced in Rel-15 to indicate whether this UE has one PA or two PAs to support the whole intra-band UL CA and doesn’t mention about the LO. Then in Rel-17 intra-band UL CA requirement definition, dualPA-Architecture capability was referred in many places to indicate that this UE has two LO.  With current RAN2 spec it might cause misunderstanding in the referred architecture about PAs or LOs since it is not one to one mapping sometimes if no restriction in the capability signaling.  Therefore, it is proposed to send LS to clarify in RAN2 38.306 that this capability is also used to indicate UE using two LO to support one intra-band UL CA. |
| Skyworks | We support providing the clarification to RAN2. For people that have not followed our discussion it might be better to clarify  “dual LO frequency” instead of “dual LO” and “single LO frequency” instead of “single LO” |
| vivo | OK to do more clarification and send to RAN2. Details and wording may need further refinements. |
| Nokia | We support the clarification as we have commented the necessity for several meetings. |
| Huawei | We are ok with the clarification. |
| Ericsson | Agreeable, we assume that this is to make consistent the relation between the dualPA-architecture that govern the MPR and the DC reporting. |
| LGE | We are fine with the revision of *dualPA-Architecture.* Also we can accept the SKW’s proposal with “dual LO frequency” and “single LO frequency” |
| Apple | We support this clarification though we also understand the original intent for *dualPA-Architecture* IE was exactly for “dual LO frequency” which was introduced mainly for intra-band non-contiguous UL CA requirements development.  One clarification in *Observation 1* in R4-2204827 is needed. Our understanding is that *dualPA-Architecture* IE was introduced in Rel-16, not Rel-15. |
| CHTTL | We share the same understanding and ok with the changes. |
| Intel | We support the clarification |

## Companies views’ collection for 1st round

### Open issues

### 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** |
|  | 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)

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
|  |  |  |

# Topic #2: PC2 Intra-band NC UL CA 1CC fallback

## Companies’ contributions summary

|  |  |  |  |
| --- | --- | --- | --- |
| **T-doc number** | **T-doc name** | **Company** | **Proposals / Observations** |
| [**R4-2204225**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_102-e/Docs/R4-2204225.zip) | 1CC Fall-Back MPR for NC UL CA with 1LO Architecture | Qualcomm Incorporated | **NC-ULCA MPR can fallback to 1CC MPR when allocation size >= [9/11.5] MHz for PC3/PC2 respectively else Backoff varies with allocation size according to Figure 2.3-4. The maximum backoff of the 1CC MPR and fallback MPR should be taken.** |
| [**R4-2204977**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_102-e/Docs/R4-2204977.zip) | Corrections on PC3 intra-band non-contiguous UL CA requirements for 2LO case | vivo, Huawei, Skyworks | **According to the discussion in R17 UE FR1 enhancement WI, for 2LO architecture, single carrier MPR requirements should be applied to 1CC allocation for NC CA case as indicated in WF R4-2202340.**  **In current Release 16 requirements, 1 CC allocation was not specifically separated. It was agreed to also update Rel-16 requirements with this latest agreement to keep spec consistency and clearance.**  **Revise the MPR applicability to single carrier requirements for 1 CC allocation for 2LO and power class 3.** |
| R4-2204978 | Corrections on PC3 intra-band non-contiguous UL CA requirements for 2LO case | vivo, Huawei, Skyworks | **reserved CR** |
| [**R4-2204979**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_102-e/Docs/R4-2204979.zip) | Adding intra-band non-contiguous UL CA requirements for PC2 2LO and PC2&3 1LO case | vivo, Huawei, Skyworks | **Adding the 1CC requirements of 2LO case for PC2 and 1LO case for PC2 and PC3. It is based on endorsed CR R4-2202298 and revision part are highlightened.**  **Add tentative value of [7] dB for the case 36 ≤ B in section 6.2A.2.2.2.3.** |

## Open issues summary

### Sub-topic 2-1: 1CC Fall-Back MPR for NC UL CA

***Issue 2-1-1: Fall-Back MPR for NC UL CA with 1LO Architecture***

* Proposal:
  + NC-ULCA MPR can fallback to 1CC MPR when allocation size >= [9/11.5] MHz for PC3/PC2 respectively else Backoff varies with allocation size according to Figure 2.3-4. The maximum backoff of the 1CC MPR and fallback MPR should be taken.

***Moderator’s recommendation:***

* Recommended WF
  + Agree the proposal and take look of the draft CR in [**R4-2204979**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_102-e/Docs/R4-2204979.zip)

|  |  |
| --- | --- |
| **Company** | **Comments** |
| OPPO | Ok with proposal. |
| Skyworks | We recognize that depending on PA architecture this issue may arise. We are OK with the proposal. I guess the complete proposal is MPR [5.5/6.5]dB for B>=[9/11.52]MHz for PC3/PC2 respectively. **[R4-2204979](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_102-e/Docs/R4-2204979.zip)** already includes these values |
| Huawei | We are ok with the proposal, which is reflected in the draft CR. |
| LGE | We are fine with the proposal for 1CC Fall-Back MPR for NC UL CA with 1LO. |
| Intel | We are ok with the proposal. |

***Issue 2-1-2: PC3 intra-band non-contiguous UL CA MPR requirements for 2LO case***

* draft CR in ([**R4-2200497**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_101-bis-e/Docs/R4-2200497.zip)):
  + Revise the MPR applicability to single carrier requirements for 1 CC allocation for 2LO and power class 3.

***Moderator’s recommendation:***

* Recommended WF
  + endorse the draft CR in 1st round discussion

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Skyworks | I assume it is for **[R4-2204977](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_102-e/Docs/R4-2204977.zip)** |
| Huawei | Ok with the draft CR. |
| LGE | Yes, reference is R4-2204977. It can be acceptable to us. |

***Issue 2-1-3: intra-band non-contiguous UL CA MPR requirements for PC2 2LO and PC2&3 1LO case***

* draft CR in ([**R4-2204979**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_102-e/Docs/R4-2204979.zip)):
  + Clarification Note in the existing MPR table for PC3 and PC2 Adding the 1CC requirments of 2LO case for PC2 and 1LO case for PC2 and PC3. It is based on endorsed CR R4-2202298 and revision part are highlightened.
  + Add tentative value of [7] dB for the case 36 ≤ B in section 6.2A.2.2.2.3.

***Moderator’s recommendation:***

* Recommended WF
  + endorse the draft CR in 1st round discussion

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Skyworks | Qualcomm’s input in **[R4-2204225](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_102-e/Docs/R4-2204225.zip)** is already included |
| vivo | Correction and possible clarifications are still needed for the following descriptions:  For PC2 UE indicating *TxD* or without indicating *TxD* respectively, MPR defined in Table 6.2.2-2 and Table 6.2D.2-1, except for B < [**11.52**] MHz where [**6.5**] dB MPR is used.  In this part, the table 6.2.2-1 and 6.2D.3-1 should be switched. And it may not be that clear for “except….” would apply to only the adjacent table or the two conditons. Some more clarifications may be needed. |
| Huawei | In general ok with the draft CR. For the issue mentioned by vivo, some clarification would be better. |
| LGE | We can support the draft CR to reflect the PC2 NC-CA UE with 2LO and 1LO. And vivo comments based QC input will be addressed in next revision. |

## Companies views’ collection for 1st round

### Open issues

### 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** |
| [**R4-2204977**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_102-e/Docs/R4-2204977.zip) (vivo) |  |
|  |
|  |
| [**R4-2204979**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_102-e/Docs/R4-2204979.zip) (vivo) |  |
|  |
|  |

## 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)

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
|  |  |  |

# Topic #3: solution for Scell dropping

## Companies’ contributions summary

|  |  |  |  |
| --- | --- | --- | --- |
| **T-doc number** | **T-doc name** | **Company** | **Proposals / Observations** |
| [**R4-2203689**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_102-e/Docs/R4-2203689.zip) | SCell dropping issue for UL CA | Apple | **Proposal 1: If the intention to prevent SCell dropping is to resolve the RAN5 conformance test issue, there is no need to introduce new RAN4 requirement to serve the said purpose.**  **Proposal 2: New RAN4 requirement may be considered if RAN1 and RAN4 jointly confirm that SCell dropping can a real field issue.**  **Proposal 3: If new RAN4 requirement would be introduced to avoid SCell dropping issue, no new RF test shall be developed to aggregate additional UE pass/fail criteria.** |
| [**R4-2204609**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_102-e/Docs/R4-2204609.zip) | Further details on resolving the Scell dropping (power prioritization) problem by power limits: signaling | Ericsson | **the configured maximum power Pcmax,f,c for the serving cells are modified by UE-specific configured power limits, a straighforward change and RAN4 scope, no change of timing requirements or UE behaviour**  **the power limits are relative to account for the actual power back-off used and the implementation-specific plane of reference for Pcmax,f,c for FR2, can be applied to all UL serving cells for complete network control of the power per serving cell**  **can be enabled/disabled and modified by MAC/CE for fast adaptation to changing radio conditions and applies for concurrent transmissions; reduces the need for enabling/disabling limits by MAC-CE signaling**  **backwards compatible**  **the limits can also be made absolute (similar to the cell-specific P-Max) by configuration**  **“equal” PSD can be achieved for the purpose of conformance testing**  The solution requires RRC changes and a MAC-CE element for activating/deactivating and modifying the limits. The power limits are proposed for the Rel-17 specifications, but a UE capability indicating support of the functionality could be used for indicating support in earlier releases (early indication).  The RAN1 specifications are not affected. |
| [**R4-2204610**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_102-e/Docs/R4-2204610.zip) | Introduction of power limits for serving cells of UL CA | Ericsson | **CR 38.101-1: Introduction of power limits for serving cells of UL CA** |
| [**R4-2204611**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_102-e/Docs/R4-2204611.zip) | Introduction of power limits for serving cells of UL CA | Ericsson | **CR 38.101-2: Introduction of power limits for serving cells of UL CA** |
| [**R4-2204826**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_102-e/Docs/R4-2204826.zip) | R17 FR1 CA PHR reporting in SCC drop | OPPO | ***Observation 1: The MPR difference can achieve more than 10dB b/w single CC and UL CA, and it makes the Pcmax under single CC is quite different from UL CA.***  ***Observation 2: The Pcmax and PHR for CA is unknown to the NW with current single CC based PHR reporting which makes NW have no idea of how much total power left in UL CA. And it leads to NW doesn’t know when to enable/disable the max power limit to prevent SCC drop.***  ***Proposal 1: It is proposed to report PHRCA for intra-band UL CA.***  ***Observation 3: The PHRCA reporting is used to provide the information of total power headroom which are not be able to be derived via current PHR reporting.***  ***Proposal 2: Clarify that the newly introduced CA PHR is not overriding per CC PHR, instead it can provide additional information that is needed for UL CA SCC dropping solutions.***  ***Proposal 3: PHRCA reporting needs to be supported for UEs which support SCC dropping solutions.***  ***Proposal 4: PHRCA can be reported via current PHR framework or newly defined MAC CE signaling to achieve faster reporting.*** |
| [**R4-2204966**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_102-e/Docs/R4-2204966.zip) | Further discussion on Scell dropping | vivo | **Observation: Though tentative signalling is tentatively agreed, detailed solution is difficult to converge.**  **Proposal 1: Further discuss and see whether a consensus can be made based on one option;**  **Proposal 2: The verification and testing method need to be considered in the process.**  **Proposal 3: If no consensus can be made in a reasonable timeframe, it is suggested to consider removing the objective in RAN.** |
| [**R4-2205589**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_102-e/Docs/R4-2205589.zip) | On SCell dropping | Huawei, HiSilicon | ***Proposal 1: It is proposed to consider the SCell dropping solution which has enough flexibility for NW to better adjust UE output power among serving cells taken requirements specifying assumptions, resource allocation manner, serving cell priority, etc. into account.***  ***Proposal 2: No need to consider the SCell dropping solution for FR1 and FR2 inter-band CA cases in current stage.***  ***Proposal 3: RAN4 should avoid to add additional test case when consider the solution to ‘scell dropping’ issue.***  ***Proposal 4: RAN4 should consider reporting Pcmax,CA and PHR for CA.***  ***Proposal 5: RAN4 should complete the feature groups for SCell dropping prevention and PHR reporting for CA in the Rel-17 feature list.*** |
| [**R4-2205590**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_102-e/Docs/R4-2205590.zip) | draft CR for TS 38.101-1 Power configuration for CA | Huawei, HiSilicon | **draft CR for TS 38.101-1: Power ratio configuration for CA** |
| [**R4-2205591**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_102-e/Docs/R4-2205591.zip) | draft CR for TS 38.101-2 Power configuration for CA | Huawei, HiSilicon | **draft CR for TS 38.101-2: Power ratio configuration for CA** |
| [**R4-2205885**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_102-e/Docs/R4-2205885.zip) | Discussion on UE behavior and root cause for dropping SCell | Qualcomm Incorporated | **Observation 1: Problem of SCell dropping occurs when two SCells are configured with channels with equal priority and UE is maximum power limited**  **Observation 2: It is not clear how will limiting UE maximum power more solve a problem that was caused by UE not having enough output power?**  **Observation 3: Cell and UE specific Pcmax must be set to 3 dB lower than UE pcmax for 2 cell case for it to have any impact on steering the power to cells with lower or equal priority.**  **Observation 4: In order the cell specific power limitation to work, the cell specific pcmax must be set to > 4.8 dB for it to solve the problem of scell dropping.**  **Observation 5: Network has the means to solve the scell dropping by priority or avoiding overlap[ping grants when UE is reporting zero PHR.**  And made one proposal:  **Proposal 1: Solve the Scell dropping issue with the solution that address the problem source i.e. equal priorities between the cells.**  **Proposal 2: The new parameter for impacting UE power control should be optional for UE under a capability.** |

## Open issues summary

### Sub-topic 3-1: Scell dropping

***Issue 3-1-1: SCell dropping solutions***

* Proposals:
  + Option 1: the configured maximum power Pcmax,f,c for the serving cells are modified by UE-specific configured power limits, and can be modified/enabled/disabled by MAC/CE for fast adaptation to changing radio conditions and applies for concurrent transmissions; the limits can also be made absolute (similar to the cell-specific P-Max) by configuration; a UE capability indicating support of the functionality could be used for indicating support in earlier releases (early indication)
  + Option 2: Power distribution among PCell and SCell proportionally should be considered at NW side according to the RB resource scheduling info for CCs, and the power ratio for PCell and SCell(s) can be configured to UE. The power ratio can be configured via RRC on UE specific basis, and enable/disable via DCI or MAC-CE for fast adaption of the dynamic RB resource allocation for PCell and SCell(s).
  + Option 3: Define new parameter to indicate priority between configured UL cells for the UE. The new parameter for impacting UE power control should be optional for UE under a capability.
  + Option 4: If only measurement issue, no new RAN4 requirement; otherwise, new RAN4 requirement may be considered if RAN1 and RAN4 jointly confirm that SCell dropping can a real field issue.
  + Option 5: If no consensus can be made in a reasonable timeframe, removing the objective in RAN.

***Moderator’s recommendation:***

* Recommended WF
  + TBA based on 1st round discussion

|  |  |
| --- | --- |
| **Company** | **Comments** |
| OPPO | Open to either solution, but if no conclusion then Option 5. |
| vivo | More discussion is needed. Option 5 might be the WF. |
| Huawei | We prefer to have a complete solution which has more flexibility. Option 2 is extension of option 1, and not limited to constant PSD, which can also be configured with priority for serving cells.  Details of the options can be further discussed in GTW session. |
| Ericsson | We support Option 1 as proponent. This option only requires a MAC-CE element specified by RAN4. No changes to the RAN1 specifications. Limits would be activated/configured/modified/deactivated by this element. The same solution for FR1 and FR2. The solution is similar to that for EN-DC and NR-DC with indicated CG limits. Moreover, for FR1 we also get UE-specific absolute power limits “for free”.  Option 2: there is no need to enforce equal PSD per cell, which would require rescaling of the power for every UL SG. Equal PSD is not the case in the field, not even for colocation. Power control is independent on the ULs and with different PL estimates per UL for example, there would not be equal PSD even with Option 2. MPR margins account for the fact that for that PSD can be different on the serving cells. How does this option work for more than two serving cells? What would be indicated by the IE? However, we support the general idea, which is the same as Option 1.  Option 3: this solution is presumably that presented in R1-2110612. This would definitively change the RAN1 specifications: power control per serving cell would not be independent (beyond scaling the total power) and introduce yet another prioritization mechanism. Network control would be unclear.  Option 4: if this were only a conformance test issue, then there would be no problem if cells are dropped as long as the UE meets the emission limits. The issue is that cells are dropped in the conformance test: would UL power control at the gNB receiver end subject to highly variable PL, PRB allocations, different transmission priorities and large absolute power tolerances prevent this in the field? Only the UE is aware of the actual power relations (that should be subject to network configuration as per Option 1). |
| LGE | Prefer option 4 and 5 |
| Apple | Option 4 or Option 5.  We have a few questions for clarifications:  1. Was the SCell dropping issue only observed in FR2 intra-band UL CA, or it was also observed in FR1 intra-band UL CA?  2. Was there any device not having SCell dropping issue or all UEs were observed with SCell dropping issue?  3. If SCell dropping is considered as the correct UE behavior based on RAN1 prioritization rule, for UEs not having the SCell dropping problem, would they be considered as not having the correct UE behavior?  4. Can any of the proposed RAN4 solutions guarantee that no SCell dropping would happen? What if the UE still observed the SCell dropping problem after applying the RAN4 solution, would the UE be considered to fail the new RAN4 requirement?  In our view, if any new RAN4 requirement would be introduced to avoid SCell dropping issue, there should be no new RF test to be developed to aggregate additional UE pass/fail criteria. |
| CHTTL | Support option 1. |
| Qualcomm | Option 3 is our preference but we can also work with option 2. |
| Nokia | The issue raised by OPPO is worth discussing it. Without knowing the remaining power, how the network decides what to do with the faster MAC CE based scheduling is in question. Hence, option 1 and 2 would not work that much. And there was a proposal to introduce Pcmax,CA and PHR for CA. However, even if they were introduced, PHR report would not be frequent enough according to comments from Ericsson during GTW if our understanding is correct. So, even if we introduced MAC/CE for fast adaptation, the network would not be able to have a threshold in terms of the remaining power. So, the listed option 1 and 2 would not work, then. And the introduction of Pcmax,CA and PHR for CA will impact on RAN1/2, then, all the option 1, 2 and 3 impacts on RAN1… |
| Samsung | Option4 and 5  1. For intra-band UL CA, actually if the network would like to calculate the PHR total, it could by taking the below three steps  Step 1) For each cc, UE report PHR per cc and Pcmax,f,c to network, then the actual power per cc= Pcmax,f,c - PHR,f,c and the total actual power= sum of actual power of each cc  Step 2) Pcmax= Pcmax,f,c  Step 3) PHRtotal = Pcmax - the total actual power  2. Now assuming that network is aware of PHRtotal, and when there is no much room for PHRtotal, the network may have 3 possible choices for next step:  Choice 1) Stop boosting the power for all cells （Stop sending the TPC up command） → ***No SCell dropping happens***  Choice 2) One possible scenario is that SNR of Pcell is very poor and there do nave a need to boost the Pcell power, Network sends the TPC up command to boost Pcell power, it means network already know the consequence that the Scell might be dropped → ***Scell dropping is a correct UE behavior***  Choice 3) Network deactives Scell → ***No SCell dropping happens***  From our understanding, Scell dropping is a correct behavior of UE, it should not be treated as a filed issue or problem, and no additional limit should be put on top of Pcmax, essentially option1/2 have impact on RAN1. On the other hand, we know TPC is DCI level which is faster than PHR reporting, however in real network, the base station would adjust the TPC based on gNB SNR measurement and UE’ PHR.  In summary, Scell dropping is a correct UE behavior and If network wants to avoid Scell dropping, it could. |

***Issue 3-1-2: Pcmax,CA and PHR for CA***

* Proposals:
  + Report Pcmax,CA and PHRCA for intra-band UL CA.
  + Clarify that the newly introduced CA PHR is not overriding per CC PHR, instead it can provide additional information that is needed for UL CA SCC dropping solutions.
  + PHRCA reporting needs to be supported for UEs which support SCC dropping solutions.
  + PHRCA can be reported via current PHR framework or newly defined MAC CE signaling to achieve faster reporting.

***Moderator’s recommendation:***

* Recommended WF
  + TBA based on 1st round discussion

|  |  |
| --- | --- |
| **Company** | **Comments** |
| OPPO | Support the proposals.  It is observed that the MPR difference b/w single CC and UL CA can achieve more than 10dB, this is a very large gap, and it makes the Pcmax under single CC is quite different from UL CA.  The Pcmax and PHR for CA is unknown to the NW with current single CC based PHR reporting which makes NW have no idea of how much total power left in UL CA. And it leads to NW doesn’t know when to enable/disable the max power limit to prevent SCC drop.  Therefore, PHRCA reporting is necessary for intra-band UL CA Scell dropping solutions if gNB configuration based power limit is intended to avoid the SCC dropping since without the information of CA power headroom there is no chance gNB can make a correct judgement whether activate or deactivate the power limit.  For the PHRca reporting it is preferred to reuse current PHR framework to reduce the workload, but new signaling to achieve even faster reporting is also acceptable.  Besides, for Pcmax,ca it can be either reported together with PHRca or not reported, since the most important information is the PHRca. |
| Huawei | We support the proposal. Larger MPR imbalance is a new issue for NR single CC and UL CA, which should be considered. |
| Ericsson | We see limited benefits of this proposal, but possibly some for inter-band UL CA. PHR does not prevent the dropping behavior and is not frequent, whereas scaling/dropping can occur every UL SG in principle. The implementation complexity of Option 1 the same from a RAN2 signaling standpoint: a new MAC-CE element.  The network is not unaware of the UE CA power levels using the existing reporting. For intra-band UL CA the Pcmax,f,c for each serving cell c is the same as the total PCMAX for the CA configuration, unless modified by limits like P-Max for example. This has been the principle for intra-band CA back-off and PH since Rel-10. The actual Pcmax,f,c configured for each cell is included in the PH for serving cell c.  For inter-band UL the PCMAX is the sum of the Pcmax,f,c or the BC power class whichever is the smallest. A PHR for CA could provide some information in cases where a HPUE UE is falling back to a lower BC power class (or the converse), this is not possible to predict using the existing signaling and the behavior is proprietary in some cases. |
| LGE | Support these proposals for Pcmax,CA and PHR for CA |
| Apple | We do not think it is feasible to report PCMAX,CA for FR2, same for single CC PCMAX. It is also not clear to us why reporting PCMAX,CA is needed to prevent SCell from dropping.  PHRCA can help prevent or reduce the chance for SCell dropping as we pointed out in our contribution R4-2112383. If the network is aware of that the UE is running out of PHR, no TPC UP command would be sent to UE. If the PCell power headroom is still not sufficient, network can just deactivate the SCell.  The PHRCA can be derived from the per Cell PHR based on power sum concept. If network would not do the calculation, then PHRCA reporting from UE may benefit the power control and resource scheduling for CA operation. |
| Nokia | We cannot agree with the proposals. The introduction of new PHR must impact not only RAN2 but also RAN1. This is not just a capability.  At the same time, we’d like to thank OPPO for pointing out the issue. We see the point. Given that PHR report is not frequent enough for network to take the into account the remaining power for scheduling. While without knowing the remaining power, how the network decides what to do with the faster MAC CE based scheduling is in question. |
| Samsung | We do not support this proposal. As mentioned in Isuue 3-1-1, if the network would like to calculate the PHR total, it could by taking the below three steps  Step 1) For each cc, UE report PHR per cc and Pcmax,f,c to network, then the actual power per cc= Pcmax,f,c - PHR,f,c and the total actual power= sum of actual power of each cc  Step 2) Pcmax= Pcmax,f,c  Step 3) PHRtotal = Pcmax - the total actual power |

***Issue 3-1-3: UE feature for SCell dropping***

* Proposals:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 16. NR\_RF\_FR1\_enh | 16-7 | Support RRC configuration to prevent SCell dropping for CA | UE capability to indicate whether to support the function.  NW configure a relative parameter for serving cells which is a UE specific RRC signalling for a set of values based on possible proportion of channel BW or allocated RB resources among the CCs, and the appropriate parameter according to CBW ratio or dynamic RB allocation ratio can be fast activated/deactivated by MAC-CE or DCI for each scheduling. The parameter set includes values of 10log10{5%, 10%, 20%, 30%, 40%, 50%, 60%, 70%, 80%, 90%, 95%, 100%}. |  | Yes | N/A | UE may drop SCell without enough transmission power according the current power control mechanism for CA |
| 16-8 | PHR reporting for CA | Support PCMAX,CA , and PHRCA reporting for CA |  | Yes | N/A | NW may not get the accurate information for the power head room for CA |

***Moderator’s recommendation:***

* Recommended WF
  + TBA. Hold on the discussion for the detailed description in 1st round and focus on the discussion for solution in Issue 3-1-1

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Ericsson | The feature group should reflect the solution adopted, if any. |
| Apple | We are fine with the recommended WF. |
|  |  |

## Companies views’ collection for 1st round

### Open issues

### 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** |
| [**R4-2204610**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_102-e/Docs/R4-2204610.zip) (CR 38.101-1) | Huawei: Besides the options discussed in Issue 3-1-1, we don’t think that Pumax test before and after the application of the configured parameter is needed. |
| Ericsson to Huawei: the verification of the maximum power per cell before and after application of the relative power limit is removed and replaced by a test that the standard PH changes. In addition, it is verified in the core specification that cells are not dropped, this is main objective and a prerequisite for the conformance tests at ‘equal PSD’. The same requirement for FR2, see revised CRs. |
| Apple: What if the SCell still dropped after the application of the relative power limit, would the UE be considered as failed the test and be scrapped? |
| Qualcomm: This is solution based on option 1 and we are not really sure if it solves the issue. Sudden un excepted scell dropping should not happen since network configures the UE. And same comment as Apple, not exactly sure if setting limits will change what UE prioritizes. So not agreed. |
| [**R4-2204611**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_102-e/Docs/R4-2204611.zip) (CR 38.101-2) | Qualcomm: The issue is between SCells with same priority, dro[ping scell over pcell is not unexpected but behavior based on RAN1 spec. So this should be limited to when UE is configured and allocated with SCells with same priority. But still, as for FR1 CR, it is not clear if this will change UE behavior. For sure, the cell with lower power limit will be transmitted but I think the intention was to ensure the cell with no power limit will be transmitted with higher probability. So not agreed. |
|  |
|  |
| [**R4-2205590**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_102-e/Docs/R4-2205590.zip) (CR 38.101-1) | Ericsson: not agreed, see comments to Issue 3-1-1. |
| Apple: How is this different from ΔPCMAX,f,c proposed in R4-2204610? In our view, the concept looks to be the same as ΔPCMAX,f,c. |
|  |
| [**R4-2205591**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_102-e/Docs/R4-2205591.zip) (CR 38.101-2) | Ericsson: not agreed, see comments to Issue 3-1-1. |
|  |
|  |

## 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)

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
|  |  |  |

# Topic #4: Others (endorsed CRs in last meeting)

## Companies’ contributions summary

|  |  |  |  |
| --- | --- | --- | --- |
| **T-doc number** | **T-doc name** | **Company** | **Proposals / Observations** |
| [**R4-2203824**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_102-e/Docs/R4-2203824.zip) | CR on UL MIMO coherence for Tx switching | China Telecom | **This CR is the re-submission of the draft CR R4-2202297 endorsed at RAN4 101e-bis.** |
| R4-2205587 | Big CR for TS 38.101-1 introduction of PC2 intra-band non-contiguous UL CA | Huawei, HiSilicon, Qualcomm, Skyworks, vivo | **Reserved to capture new agreements in this meeting** |
| [**R4-2205588**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_102-e/Docs/R4-2205588.zip) | Big CR for TS 38.101-1 contiguous CA with UL MIMO for power class 2 | Huawei, HiSilicon | **The big CR is based on endorsed CR in R4-2119516 and R4-2202299.** |

## Open issues summary

### Sub-topic

## Companies views’ collection for 1st round

### Open issues

### 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** |
| [**R4-2203824**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_102-e/Docs/R4-2203824.zip) (China Telecom) |  |
|  |
|  |
| [**R4-2205588**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_102-e/Docs/R4-2205588.zip) (Huawei) | Skyworks: we support the CR but would like to clarify with the group whether there should be some text to point at the appropriate MPR when MIMO is not configured and depending on wehther the UE support a full power PA or not. |
| Huawei: in our view, if not for UL MIMO, such clarification of full PA or not seems not necessary. In that case, UE depends on indication of TxD for the applicable requirements. |
|  |
|  | 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)

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
|  |  |  |

1. Recommendations for Tdocs
   1. 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 |  |
| [**R4-2203689**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_102-e/Docs/R4-2203689.zip) | SCell dropping issue for UL CA | Apple |  |  |
| [**R4-2203824**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_102-e/Docs/R4-2203824.zip) | CR on UL MIMO coherence for Tx switching | China Telecom |  |  |
| [**R4-2204225**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_102-e/Docs/R4-2204225.zip) | 1CC Fall-Back MPR for NC UL CA with 1LO Architecture | Qualcomm Incorporated |  |  |
| [**R4-2204609**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_102-e/Docs/R4-2204609.zip) | Further details on resolving the Scell dropping (power prioritization) problem by power limits: signaling | Ericsson |  |  |
| [**R4-2204610**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_102-e/Docs/R4-2204610.zip) | Introduction of power limits for serving cells of UL CA | Ericsson |  |  |
| [**R4-2204611**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_102-e/Docs/R4-2204611.zip) | Introduction of power limits for serving cells of UL CA | Ericsson |  |  |
| [**R4-2204826**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_102-e/Docs/R4-2204826.zip) | R17 FR1 CA PHR reporting in SCC drop | OPPO |  |  |
| [**R4-2204827**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_102-e/Docs/R4-2204827.zip) | R17 FR1 clarification of dualPA-architecture capability | OPPO |  |  |
| [**R4-2204966**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_102-e/Docs/R4-2204966.zip) | Further discussion on Scell dropping | vivo |  |  |
| [**R4-2204977**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_102-e/Docs/R4-2204977.zip) | Corrections on PC3 intra-band non-contiguous UL CA requirements for 2LO case | vivo, Huawei, Skyworks |  |  |
| R4-2204978 | Corrections on PC3 intra-band non-contiguous UL CA requirements for 2LO case | vivo, Huawei, Skyworks |  | *Reserved Cat-A CR* |
| [**R4-2204979**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_102-e/Docs/R4-2204979.zip) | Adding intra-band non-contiguous UL CA requirements for PC2 2LO and PC2&3 1LO case | vivo, Huawei, Skyworks |  |  |
| R4-2205587 | Big CR for TS 38.101-1 introduction of PC2 intra-band non-contiguous UL CA | Huawei, HiSilicon, Qualcomm, Skyworks, vivo |  | *Reserved big CR* |
| [**R4-2205588**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_102-e/Docs/R4-2205588.zip) | Big CR for TS 38.101-1 contiguous CA with UL MIMO for power class 2 | Huawei, HiSilicon |  |  |
| [**R4-2205589**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_102-e/Docs/R4-2205589.zip) | On SCell dropping | Huawei, HiSilicon |  |  |
| [**R4-2205590**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_102-e/Docs/R4-2205590.zip) | draft CR for TS 38.101-1 Power configuration for CA | Huawei, HiSilicon |  |  |
| [**R4-2205591**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_102-e/Docs/R4-2205591.zip) | draft CR for TS 38.101-2 Power configuration for CA | Huawei, HiSilicon |  |  |
| [**R4-2205885**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_102-e/Docs/R4-2205885.zip) | Discussion on UE behavior and root cause for dropping SCell | Qualcomm Incorporated |  |  |

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
   1. 2nd round

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

Notes:

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

# Annex

Contact information

|  |  |  |
| --- | --- | --- |
| **Company** | **Name** | **Email address** |
| Apple | James Wang | fucheng\_wang@apple.com |

Note:

1. Please add your contact information in above table once you make comments on this email thread.
2. If multiple delegates from the same company make comments on single email thread, please add you name as suffix after company name when make comments i.e. Company A (XX, XX)