**3GPP TSG-RAN WG4 Meeting # 102-e R4-2206414**

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

**Agenda item:** 9.27 and 9.28

**Source:** Moderator (Huawei)

**Title:** Email discussion summary for [102-e][114] NR\_BCS4\_MSD\_Inter\_Band\_ENDC

**Document for:** Information

# Introduction

This email discussion handles the contributions submitted to agenda item 9.27 and 9.28 for NR\_BCS4 and MSD\_Inter\_Band\_ENDC. The scope of this email discussion covers the maximum aggregated bandwidth for intra-band CA with BCS4/BCS5, Improvements to MSD table, and some CRs. There are three topics listed as below in this email discussion and multiple sub-topics within each of them.

#1 The maximum aggregated bandwidth for intra-band CA with BCS4/BCS5

#2 Improvements to MSD table

#3 Discussion on CRs

# Topic #1: The maximum aggregated bandwidth for intra-band CA with BCS4/BCS5

## Companies’ contributions summary

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| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2204486 | Nokia, Nokia Shanghai Bell | **Proposal 1: RAN4 Send an LS to RAN2 to find out the best resolution among the followings.**   1. Use the current IEs: supportedBandwidthUL/DL and channelBWs-DLUL. 2. UE provides multiple feature sets for those BCs, covering all possible CBW aggregation below the supported max limit. Problem: it increases the UE-Capability message size 3. Add a new UE capability which indicates the max aggregated CBW that the UE supports   **Proposal 2: When BCS4 or 5 for intra band CA is requested, max aggregated CBW shall be provided.** |
| R4-2204509 | Qualcomm Incorporated | **Observation 1: Multiple feature sets approach will introduce a huge amount of signalling overhead and the note that allowing the change for maximum aggregated CBW in future release will make the spec inconsistent.**  **Proposal 1: Introduce a new signalling for BCS4 and BCS5 to report the maximum aggregated bandwidth for intra-band CA per band combination.**  **Proposal 2: If the Proposal 1 is agreed in RAN4, RAN4 should further discuss in which release BCS4 can be introduced.** |
| R4-2205117 | Xiaomi | **Proposal 1: Intra-band non-contiguous CA has not the issue whose maximum aggregated bandwidth is below the theoretically possible max aggregated CBW.**  **Proposal 2: From the view of UE Spec**   * **Solution 1: the proponent should solve all the issues including the degradation due to larger CBW, if they request BCS4/BCS5 for the intra-band contiguous CA.** * **Solution 2: the maximum aggregated bandwidth should be defined as the theoretically possible max aggregated CBW and it allows to introduce one note as the maximum aggregated bandwidth is XX MHz in Rel-XX.**  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | | NR CA configuration / Bandwidth combination set | | | | | | | | | | NR CA configuration | Uplink CA configurations or single uplink carrier5 | Channel bandwidths for carrier (MHz) | Channel bandwidths for carrier (MHz) | Channel bandwidths for carrier (MHz) | Channel bandwidths for carrier (MHz) | Channel bandwidths for carrier (MHz) | Maximum aggregated  bandwidth (MHz) | Bandwidth combination set | | CA\_n5B | CA\_n5B | See n5 channel bandwidths in Table 5.3.5-1 for each carrier2 | |  |  |  | 25x | 4 and 5 | | Note x: the maximum aggregated bandwidth is 20MHz in Rel-XX. | | | | | | | | |   **Proposal 3: modify the constraint condition for intra-band contiguous CA as**  **min{n\*max channel bandwidth of each carrier, BWChannel\_CA of each CA bandwidth class, floor(Maximum frequency range of each band/5MHz)\*5MHz} for intra-band contiguous CA.**  **Proposal 4: From the network perspective:**   * **Option1: Introduce new UE capability to report the maximum aggregated bandwidth of intra-band CA per BC.** * **Option 2: The network could store the information of the actual maximum aggregated bandwidth for BCS 4/5 indicated in the Note for those intra-band CA.**   **Proposal 5: if apply Option 1 in proposal 4, which release the new UE capability should be release independent need FFS.** |
| R4-2205118 | Xiaomi | This contribution is a text proposal for TR 38.862 v0.5.0 to modify the rule of the maximum aggregated bandwidth for intra-band CA with BCS4/BCS5. |

## Open issues summary

### Sub-topic 1-1

*Sub-topic description:*

**Issue 1-1-1: Is text proposal (R4-2205118) for TR 38.862 approved?**

* Proposals
  + Option 1: Agree this proposal (The corresponding TP R4-2205118 can be approved)
  + Option 2: Do not agree this proposal (The corresponding TP R4-2205118 can be noted)
  + Option 3: The proposal need to be revised with suggestions (The corresponding TP R4-2205118 can be revised)
* Recommended WF
  + TBA

**Issue 1-1-2: Discussion on whether the maximum aggregated bandwidth can be changed for intra-band contiguous CA with BCS4/5 in the later release or not:**

Proposals

* + Option 1: Yes, it’s allowed.
  + Option 2: No, it may cause spec inconsistency.
  + Option 3: Other views.
* Recommended WF
  + TBA

**Issue 1-1-3: If the maximum aggregated bandwidth can be changed for intra-band contiguous CA with BCS4/5 in the later release, the following solutions can be discussed to solve the inconsistency issue among different spec releases:**

Proposals

* + Option 1: Use the current IEs: supportedBandwidthUL/DL and channelBWs-DLUL.
  + Option 2: UE provides multiple feature sets for those BCs, covering all possible CBW aggregation below the supported max limit.
  + Option 3: Add a new UE capability which indicates the max aggregated CBW for intra-band CA per band combination with BCS4/5
    - Option 3a: RAN4 should further discuss in which release BCS4 can be introduced.
    - Option 3b: which release the new UE capability should be release independent need FFS
    - Option 3C: Other proposals are not precluded.
  + Option 4: it allows to introduce one note as the maximum aggregated bandwidth for intra-band CA with BCS4/5 is XX MHz in Rel-XX. And the network could store the information of the actual maximum aggregated bandwidth for BCS 4/5 indicated in the Note for those intra-band CA.
  + Option 5: Other solutions.
* Recommended WF

TBA

**Issue 1-1-4: If the maximum aggregated bandwidth can’t be changed for intra-band contiguous CA with BCS4/5 in the later release, it will not cause the spec inconsistency issue. The following principles can be discussed.**

Proposals

* + Option 1: When BCS4 or 5 for intra band CA is requested/specified, max aggregated CBW shall be provided and can’t be changed in later release.
  + Option 2: The theoretically possible max aggregated CBW for intra-band contiguous CA with BCS4/5 should be specified, and the proponent should solve all the issues including the degradation due to larger CBW, if they request BCS4/BCS5 for the intra-band contiguous CA.
  + Option 3: Other solutions.
* Recommended WF

TBA

## Companies views’ collection for 1st round

### Open issues

Sub-topic 1-1

|  |  |
| --- | --- |
| **Company** | **Comments** |
| ZTE | **Issue 1-1-1:**  For all the existing channel bandwidths, they are all multiple of 5MHz. So the max. Agg CBW is indeed as 5x.  However, if smaller than 5MHz CBW are introduced in future, then the formula cannot be applied. So why not keep the existing wording as ‘Maximum frequency range of each band’ since it can cover all the possibilities.  **Issue 1-1-2:**  Option 1: Yes, it’s allowed.  If the max. Supported channel bandwidth are changed for a certain band, then the max. Agg BW could be changed for BCS4/5 intra-band C CA.  **Issue 1-1-3:**  We are interesting in Option 3. We are wondering if option 3 is adopted, then the previous agreements would be overtruned since BCS4 cannot be released independent from Rel-15 anymore. Also, if option 3 is adopted, why RAN4 needs both BCS4 and BCS5 at the same time?  For Option 4, how the NW distingurish the different Max.agg BW for the same BCS4/5?  In addition, in terms of the discussion, it seems it become more difficult to apply BCS4/5 to intra-band, so is it possible to exclude BCS4/5 for intra-band? i.e. just apply BCS4/5 to inter-band.  Also, we would ask a question, considering this meeting is the last R17 meeting, so if no agreements are achieved in this meeting, then how to consider BCS4/5 in Rel-17 or what is the next step? Due to inter-band NR CA also include the intra-band CA in the uplink with BCS4/5, so it would impact intra-band and inter-band CA as a package. |
| Qualcomm | **Issue 1-1-1:**  Why we need this change? The original text is the theoretical maximum aggregated CBW which is always correct.  **Issue 1-1-2:**  Option 1 is OK if a new signalling for maximum aggregated CBW is introduced. Otherwise, the network could not identify the maximum aggregated CBW of earlier and later release UEs with BCS4/5 if the maximum aggregated CBW can is changed in later release.  **Issue 1-1-3:**  We support Option 3. We have concerns about Option 2 since it will lead to huge overhead. We have the similar view as ZTE that if a new signalling is introduced, BCS4 could not be release independent. In that case, why we need to identify BCS4 and BCS5? |
| Nokia | **Issue 1-1-1**  Whichever is selected, we should not spend our time on this. There is no additional benefit from this discussion…  **Issue 1-1-2**  Option 1  We have no choice but allowing to change maximum aggregated bandwidth and this cannot be avoided even if RAN4 decides to specify all the possible aggregated CBW with the existing CBW as far as RAN4 allows the introduction of a new CBW. As ZTE commented, if a wider CBW is introduced into a band, it is likely that maximum aggregated bandwidth changes if the band has intra band CA.  **Issue 1-1-3**  We respectfully disagree with Option 4. Regarding the others, i.e., 1, 2 and 3, we should ask RAN2 for which one the best is.  Regarding Option 4, this must not be the option. What is the additional meaning to just capture pass bandwidth as max aggregated CBW? We are ok to capture currently available/specified max aggregated CBW itself, but we don’t agree with this proposal. Store or not store does not matter. Network needs measures to distinguish UEs with different maximum aggregated bandwidth…  For Option 1, this indirectly means postponing the issue now. This is because the current signaling does not allow UEs to express what the max aggregated CBW whose requirements are available is unless multiple feature set per CC is used. In the future, we need to introduce a new capability to differentiate the legacy UE without the capability and UE with the capability if multiple feature set per CC is not used.  Regarding option 3, we’d like to correctly understand the comment from Qualcomm and ZTE that “*if a new signalling is introduced, BCS4 could not be release independent*”. Is the precondition of the comment that the new signaling is introduced from Rel-17, right? If the new signaling is introduced, it would be introduced from Release 17 together with BCS5 as we introduced a min channel bandwidth. So, BCS4 must be still release independent from Rel-15, mustn’t it?  **Issue 1-1-4**  We don’t agree with all the options. We’d like to better understand the motivation of the question. The question and provided options are not directly related to each other.  For option 1, What does it mean “can’t be changed in later release”. If so, we may need to stop applying BCS4/5 to intra band CA. As we commented, in the previous inquiry, there is a possibility to define wider maximum aggregated CBW if a wider new CBW is introduced later anyway. There is no point to discuss change or can’t change it.  For Option 2, in our understanding, the benefit of this option is it can delay the problem until a new wider CBW is introduced into a band. The side effect is UE may need to meet requirements for ever not to be used and RAN4 needs to spend our time on them. Also, when an operator wants a wider CBW in a band together with intra band CA in the beginning of a certain release, they need to wait for the end of the release to get RAN2 specification. So, the product may not be able to be delivered in a timely manner. |
| Ericsson | **Issue 1-1-1**  We firstly need to decide how the specification is to be written before we discuss this.  **Issue 1-1-2**  If there are absolutely no way to inform the NW about max aggregated BW, then this information cannot be changed in the specification, i.e. option 2.  If we find a solution in issue 1-1-3, we can reconsider our answer on issue 1-1-2.  **Issue 1-1-3**  Option 3 is out of the question. RAN4 already agreed after lengthy discussions that BCS4 is without signaling and we are not in favour of a considerable delay of BCS4. We are very surprised this discussion is restarted.  We are in favour of using existing signaling possibilities, which is close to option 2 (where we see option 1 as a subset of option 2, as supportedBandwidthDL/UL is the key IE to vary over the feature sets per CC). Already today UEs with limited throughput capability may need to limit the aggregated BW in the band combinations and feature set combination as it cannot support the full channel BW on each of the carriers simultaneously. So UEs’ already today tell the NW about their limitation using feature set combinations, e.g 100+40, 90+50, 80+60, 70+70. There is no other solution for this problem in specs today as there is no IE to signal an maximum aggregated BW over the entire BC. So the extra signaling that is discussed here is already happening and apparently this is acceptable as no work is ongoing to change this. To us it seems very strange if we at this point are to introduce a “max aggregated BW intra-band” IE just for BCS4 when this has been an issue all along.  This is more for RAN2 to answer, but as a side note we agree that if UE has to resort to indicating aggregated BW limitations via supportedBandwidth in FSpCC then this will increase the capability signaling to some extent. However, we are not sure this is a large problem is in practice. But suggest to let RAN2 comment that instead of us speculating.  **Issue 1-1-4**  If there are no agreement on issue 1-1-3, we have to use option 1. i.e. no change on max aggregated BW.  Also it can be noted that it is not relevant to discuss in which release the change is done. The NW don’t know when a UE signals the release it support whether it supports and early or a late specification in that release, and the max aggregated BW can have been changed in the middle of a release. |
| T-Mobile USA | **Issue 1-1-1**  We don’t think this change is needed  **Issue 1-1-2**  Option 2: We think it may never be necessary to change the maximum aggregated BW for BCS4/5. Some things to consider:   1. We think that this is only a potential issue for some intra-band combinations, but not others. For instance, for CA\_n41C and CA\_n41(2A) BCS4 the maximum aggregated bandwidth is 190 MHz and cannot be increased. For other combinations, including CA\_n71B, CA\_n25(2A), CA\_n25(3A), CA\_n66(2A), CA\_n71(2A) we have requested the full bandwidth of the band, so max aggregated bandwidth could never increase. 2. The maximum aggregated bandwidth does not necessarily have to change just because new carrier bandwidths are added. The UE indicates which BCS is supports and also what bandwidths that it supports for each band. So if the maximum BW for a band is 20 MHz and the total bandwidth for the band is 50 MHz, BCS4 could be defined with a maximum bandwidth of 50 MHz, and the UE would only have to implement up to 20+20 MHz if it only supports 20 MHz carriers. If 25 MHz carriers are later added, UEs could use the same BCS but now report that they also support 25 MHz for the band, so 50 MHz for the combination. Now, if we ever defined channel BWs > 100 MHz for FR1 then maybe a new maximum aggregated BW would be needed for CA\_n77C, but we’re not sure how realistic of a possibility this is. 3. The example that Nokia gave for CA\_n7B may never cause problems if 50 MHz is sufficient for CA\_n7B and no operator every request support for > 50 MHz. It is not clear if any operator would every have more than 50 MHz of contiguous spectrum to require such an increase of the maximum aggregated BW.   If there is a reasonable solution in 1-1-3, then we can reconsider our answer on issue 1-1-2.  **Issue 1-1-3**  We prefer Option 2. We understand it would add a lot of signalling overhead, but we’re not sure it is worth pursuing a solution for a theoretical problem that may never impact the specs if there turns out to be no reason to change the maximum aggregated bandwidth.  On Option 1, If we go with new signalling, we should leave the details up to RAN2. supportedBandwidthUL/DL and channelBWs-DLUL are not currently signalled for aggregated bandwidth. It is not clear if these could be re-used, but if they can be, re-using the IE for a different purpose would likely still have an impact on the ASN.1.  **If Option 3 is chosen, the new capability signal can only apply to BCS5.** There are already intra band CA combinations like CA\_n41(2A) and CA\_n41C that have the maximum possible aggregated bandwidth and would not be impacted by any new signalling. We have also requested BCS4 for many other intra-band combinations that use the maximum possible aggregated bandwidth, so there’re would be no reason to increase it in the future.  **Issue 1-1-3**  We prefer Option 2. That is what we have chosen for all of the BCS4 combinations we have requested. |
| Xiaomi | **Issue 1-1-1:**  The intention is to help those bands whose frequency range is not multiple of 5MHz decide the real max aggregated BW, like the frequency range of n41 is 194MHz, but the max aggregated BW of CA\_n41 C is 190MHz not 194MHz.  **Issue 1-1-2**  The value cannot be changed If there is no singling to inform the NW about the max aggregated BW.  **Issue 1-1-3**  If there need a capability for UE to inform the NW about the max aggregated BW, we prefer Option 3. |
| Huawei | **Issue 1-1-1:**  I don’t think we need this change. The original text is the theoretical maximum aggregated CBW which is always correct.  **Issue 1-1-2:**  Option 2, since it will cause some inconsistency in spec among different releases, maximum aggregated bandwidth can’t be changed for intra-band contiguous CA with BCS4/5 in the later release.  To response ZTE and Nokia’s concerns, if the max. Supported channel bandwidth are changed for a certain band, a new BCS can be introduced for this intra-band combination. This BCS can be a traditional BCS with clear bandwidth combination set. This BCS can also be 20/21 which have the same meaning with BCS4/5 but with a larger maximum aggregated CBW. Since RAN2 has reserved 32 bits BCS for us, we can reuse these capability elements as soon as possible instead of introducing new capabilities for this concern case.  **Issue 1-1-3**  I agree with Ericsson. There is no need to open this controversial discussion in the end of Rel-17. Furthermore, we can have a simple solution by assuming maximum aggregated bandwidth can’t be changed for intra-band contiguous CA with BCS4/5 in the later release. Thus, there is no need to further discuss this issue.  **Issue 1-1-4**  Both option 1 and option 2 are OK and feasible.  To ease the concerns raised by ZTE and Nokia for some potential corner case, we can also have option 3 as below.  Option 3.  If the max. Supported channel bandwidth are changed for a certain band, a new BCS can be introduced for this intra-band combination. This BCS can be a traditional BCS with clear bandwidth combination set. This BCS can also be 20/21 which have the same meaning with BCS4/5 but with a larger maximum aggregated CBW. Since RAN2 has reserved 32 bits BCS for us, we can reuse these capability elements as soon as possible instead of introducing new capabilities for this concern case. |
| Skyworks | **Issue 1-1-1:**  It is key to ensure that the max. agg. CBW does not exceed the maximum bandwidth of the band. So, the initial equation is fine with us.  What is less clear is whether RAN4 allows a maximum aggregated BW for intra-band CA to exceed the maximum CBW of each CC specified for a given band. Here are two examples of TPs we flagged from [110] because we thought this was creating inconsistencies in the specifications. After explanations from the proponent, we could not find any rule that forbids such operation, but we would welcome any clarification on this topic:   * [**R4-2205254**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_102-e/Docs/R4-2205254.zip)**:** this TP introduces max. agg. CBW of 60MHz while the maximum supported CBW per CC for band n3 is 50MHz. * [**R4-2205255**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_102-e/Docs/R4-2205255.zip)**:** this TP introduces max. agg. CBW of 50MHz while the maximum supported CBW per CC for band n38 is 40MHz.   In any case, we want to re-iterate that BCS4/5 for intra-band is not a preferred approach. Especially for FDD bands where MSD analysis can be quite time consuming.  **Issue 1-1-2:**  Option 1, unless we have mis-understood the motivation of BCS4.  Our understanding is that by definition of BCS4/5, if a new CBW is added to a given band, the corresponding intra-band BCS4/5 combination has no choice but to support also that new CBW. For FDD bands that opens the door for more MSD analysis. |
| Nokia | **Issue 1-1-2 & Issue 1-1-3**  To Huawei: if we define a new BCS if a wider CBW is introduced into a band, what is the point of this BCS4 discussion.  The introduction of a new capability of max aggregated CBW is not our preference. This does not come from us but rather comes from T-Mobile USA’s comment in the last meeting.  We are saying that if we keep the principle of BCS4 while RAN4 specifies requirements for up to max aggregated CBW among requested bandwidth combinations by opetorrs, in the future, there may be the case that the maxa agreegated CBW becomes wider.  Until then, we can live with the option 1 and/or 2 listed under Issue 1-1-3. Since the situation is different from min channel bandwidth in terms of that we have a resolution, i.e., the option 2. So, if we cannot reach a consensus, we just postpone the discussion. But we insist that max aggregated CBW whose requirements are available shall be reflected in thes spec as we hav now. And when operators request new intra CA configurations, the request shall include max aggregated CBW info. |
| Qualcomm | Response to Nokia’s following comments:  “Regarding option 3, we’d like to correctly understand the comment from Qualcomm and ZTE that “*if a new signalling is introduced, BCS4 could not be release independent*”. Is the precondition of the comment that the new signaling is introduced from Rel-17, right? If the new signaling is introduced, it would be introduced from Release 17 together with BCS5 as we introduced a min channel bandwidth. So, BCS4 must be still release independent from Rel-15, mustn’t it?”  We assumed the max aggregated CBW issues apply for both BCS4 and BCS5. For BCS5, introducing a new signalling will not make any change on the release independent. But for BCS4, it will make BCS4 could not be release independent from Rel-15.  As we commented, from UE side, we have concerns about using multiple feature sets to indicate the all the possible CBW combinations considering the high overhead. Considering it is close to the completion time for this BCS4 WI, maybe we can just fix the aggregated CBW intra-band CA for BCS4, and if there is new request from operators for wider aggregated CBW, the new aggregated CBW should be reflected in the new spec.  Meanwhile seems all the companies are OK to introduce new signalling for BCS5. |

## 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 #1-1** | *Issue 1-1-1:*  *Five companies prefer the original wording. Two companies think there is no need to discuss it. Only proponent support this TP.*  *Tentative agreements:*  *From Moderator’s perspective, keep the original wording considering the majority view.*  *Candidate options:*  *Recommendations for 2nd round:*  TP R4-2205118 can be noted.  *Issue 1-1-2:*  *Four companies support option 1. And four companies support option 2.*  *Moderator propose that the maximum aggregated bandwidth can’t be changed for intra-band contiguous CA with BCS4/5 in the later release to avoid creating new issues, considering the following reasons.*   1. *Progress of R17 work.,* 2. *Wider maximum aggregated bandwidth for BCS4/5is just a potential corner case and RAN4 have no this issue so far.* 3. *Even if this corner case happen, we can introduce another BCS to solve it.*   *Tentative agreements:*  *Candidate options:*  *Recommendations for 2nd round:*  *Further discuss the following proposal in the second round:*  *The maximum aggregated bandwidth can’t be changed for intra-band contiguous CA with BCS4/5 in the later release to avoid creating new issues.*  *Issue 1-1-3:*  *Since we have no conclusion on issue 1-1-2, postpone the discussion on issue 1-1-3.*  *Tentative agreements:*  *Candidate options:*  *Recommendations for 2nd round:*  *Issue 1-1-4:*  *Since we have no conclusion on issue 1-1-2, postpone the discussion on issue 1-1-4.*  *Tentative agreements:*  *Candidate options:*  *Recommendations for 2nd round:* |

### CRs/TPs

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

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

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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)

**Subtopic 1-2: In order to complete this WI timely, discuss whether the following proposal provided by moderator can be acceptable.**

*The maximum aggregated bandwidth can’t be changed for intra-band contiguous CA with BCS4/5 in the later release to avoid creating new issues.*

* Proposals
  + Option 1: Yes, proposal can be acceptable.
  + Option 2: Others.
* Recommended WF
  + TBA

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| --- | --- |
| **Company** | **Comments** |
| Huawei | We support option 1. |
| Nokia | We definitely don’t agree with the Option 1. And we are afraid that the provided option does not make sense. This implies that this just makes the BCS4’s original purpose lost since a new BCS would have to be introduced if a wider max aggregated channel bandwidth proposed later if max aggregated channel bandwidth was not able to be changed anymore in the future.  In any case, we can live with the option 1 and/or 2 listed under Issue 1-1-3. Hence, the conclusion can be postponed until a wider max aggregated channel bandwidth is proposed in the future. But we insist that max aggregated CBW whose requirements are available shall be reflected in the spec as we have now. And when operators request new intra CA configurations with BCS4 or 5, the request shall include max aggregated CBW info. Otherwise, we cannot know requirements for up to how wider max aggregated channel bandwidth should be specified. |
| ZTE | Option 2: Others.  As commented in the 1st round, we still think if the max. Supported channel bandwidth are changed for a certain band, then the max. Agg BW could be changed for BCS4/5 intra-band C CA.  In addition, it seems it dosenot make much sence that more than BCS5 (such as BCS6) is introduced in the specfication. Otherwise, the benifit of BCS4/5 may lost.  Also we agree with Nokia that the max aggregated CBW info should be included when proponent request intra CA configurations with BCS4 or 5, it is partial information in intra CA configurations requesting.  And if we agree to postpone it until a wider max aggregated channel bandwidth is proposed in the future, then does it means the current agreements of ‘BCS4 is release independence from Rel-15 and BCS5 is release independence from Rel-17’ are still valid and wouldn’t be overturned regardless of whether or not maximum aggregated bandwidth can be changed in future, is that correct understanding? |
| Ericsson | We support option 1. |
| Xiaomi | Support Option 1 |
| Qualcomm | We are OK with option 1 even though it is not a perfect solution. We have concerns about changing the max aggregated channel bandwidth in the future release without defining a new BCS. It is saying if the wider max aggregated channel bandwidth is introduced in future, a new BCS should be introduced. As we commented in the first round, we have concerns about the multiple feature sets approach due to the huge signalling overhead. We think the possible solution to avoid specifying new BCS is to introduce a new signalling to indicate the maximum aggregated channel bandwidth for intra-band CA but this approach did not get the consensus. |
| Nokia | So, BCS4 or 5 is not applicable to intra band CA. Is that correct? If we use BCS4 or 5 with this incomplete condition, in the end, the following text shall be revisited and will cause confusions.  For inter-band CA combinations including FR1 intra-band CA and with BCS4 or BCS5, the Bandwidth Combination Sets for the FR1 intra-band CA are BCS4 or BCS5. |
| T-Mobile USA | We support option 1 for bands where the maximum aggregated bandwidth is not controversial, like n41. We already have BCS4/5 for CA\_n41(2A) and CA\_n41C in 38.101-1, so it is too late to say that BCS4 and 5 are not applicable to intra-band CA.  For n41 intra-band CA there were no issues raised with defining the maximum aggregated as the maximum possible value. For other bands, like CA\_n7B there may be a need to limit the maximum aggregated bandwidth to something less than the maximum possible value, as originally suggested by Nokia. If or when BCS4 is requested for combinations like CA\_n71B, RAN4 can decided if it is appropriate to use the maximum theoretical value (70 MHz) or to use a lower value (50 MHz). If RAN4 can agree that the maximum value will never change, then there is no problem. If RAN4 thinks that the maximum value may change, then new signalling may be needed to indicate a maximum aggregated intra-band BW, as mentioned by Qualcomm, it is important for backward compatibility that any such new signalling can only apply to BCS5, and not BCS4. |
| Xiaomi | Not all intra-band CA will have the issue that the max aggregated BW will be changed in future, like CA\_n41C, unless the band frequency will be changed. Just for the problematic intra-band combinations, BCS 4/5 is not applicable tentatively, not all intra-band combinations can’t apply BCS4/5. |

## Summary for 2nd round

5 companies (Huawei, Xiaomi, Ericsson, Qaulcomm, T-Mobile USA) support option 1 and two companies (ZTE, Nokia) have concerns on option 1. Company don’t agree that BCS4 or 5 is not applicable to intra band CA, because some intra-band CA can support BCS4 or 5 without any issues, e.g. CA\_n41(2A) and CA\_n41C. For some potential problematic intra-band combinations, the applicability for BCS4/5 and how to define the maximum channel bandwidths should be further discussed, e.g. CA\_n7B.

No change on current spec and max aggregated CBW whose requirements are available shall be reflected in the spec as we have now.

# Topic #2: Improvements to MSD table

## Companies’ contributions summary

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| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2204053 | CHTTL | **Proposal 1: When considering MSD table improvement for the harmonic or cross-band isolation (>ACLR2), two MSD requirements for a given MSD type and a given band combination can be considered at least, one for the minimum victim downlink channel bandwidth and the other for the largest victim downlink channel bandwidth.** |
| R4-2205280 | Huawei, HiSilicon | **Observation 1: the WF guideline can be applicable to ENDC band combinations from R17, since the impact on ENDC combos for R17 is limited based on the summary above.**  **Proposal 1: More than one MSD test point can be introduced for a given band combination based on the reasonable judgement, but the maximum number of MSD test point can be five and it’s allowed to test only one configuration.**  **Proposal 2: The MSD test point for CA\_n18-n28 is proposed as below.**   |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | **UL band** | **DL band** | **UL Fc** | **UL BW** | **SCS of UL band** | **UL RB Allocation** | **DL Fc** | **DL BW** | **MSD** | **X band interference source** | | **(MHz)** | **(MHz)** | **(kHz)** | **LCRB** | **(MHz)** | **(MHz)** | **(dB)** | | n18 | n28 | 822.5 | 15 | 15 | 18 (RBstart=0) | 785.5 | 5 | 2.6 | >ACLR2 |   **Proposal 3: the MSD test point for CA\_n1-n3 and CA\_n1-n40 due to the “ACLR1/ACLR2” interference is proposed as below.**   |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | **UL band** | **DL band** | **UL Fc** | **UL BW** | **SCS of UL band** | **UL RB Allocation** | **DL Fc** | **DL BW** | **MSD** | **X band interference source** | | **(MHz)** | **(MHz)** | **(kHz)** | **LCRB** | **(MHz)** | **(MHz)** | **(dB)** | | n1 | n3 | 1945 | 50 | 15 | 270 (RBstart=0) | 1877.5 | 5 | 22.5 | ACLR1/2 | | n40 | n1 | 2340 | 80 | 30 | 270 (RBstart=0) | 2167.5 | 5 | TBD | ACLR1/2 |   **Proposal 4: To use the same format for both Tx harmonic interference table and Rx harmonic mixing table.**  **Proposal 5: Option 2 can be used as the format of MSD table due to harmonics.**  **Option 2:**   |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | | **UL band** | **DL band** | **UL BW** | **SCS of UL band** | **UL RB Allocation** | **DL BW** | **MSD** | **UL/DL fc condition** | **UL/DL harmonic order** | | **(MHz)** | **(kHz)** | **LCRB** | **(MHz)** | **(dB)** | | nX | nY | 5 | 15 | 25 (RBstart=0) | 10 | 23.5 | Note1 | UL2/DL1 | | Note 1: The requirements should be verified for UL EARFCN or NR ARFCN of the aggressor (lower) band (superscript LB) such that in MHz and  with carrier frequency in the victim (higher) band in MHz and the channel bandwidth configured in the lower band. | | | | | | | | | |
| R4-2206142 | Skyworks Solutions Inc. | **Proposal 1: Introduce simplifications to NR-CA MSD tables due to Cross-band isolation and due to Harmonics (UL or Rx harmonic mixing) in Release 17. Companies are encouraged to bring CRs at next meeting once the number of test points per type of MSD is agreed at this meeting.**  **Proposal 2: For MSD due to cross-band isolation, keep 1 test point per NR-CA combination, and optionally, on a case-by-case basis, evaluate the necessity to retain one additional test point to account for C-IM interference. The guidelines for configuring both the UL band and the DL affected band carrier configurations can be found in WF [2] and in agenda item 9.6.1 at this meeting. A generic table format is proposed in Table 1 below.**  Table 1: Proposal to simplify MSD tables due to Cross-band isolation for NR-CA.   |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | **UL band** | **DL band** | **UL Fc** | **UL BW** | **SCS of UL band** | **UL RB Allocation** | **DL Fc** | **DL BW** | **MSD** | **X band interference source** | | **(MHz)** | **(MHz)** | **(kHz)** | **LCRB** | **(MHz)** | **(MHz)** | **(dB)** | | nX | nY | Fc,UL,X | CBWX | SCSx | LCRB,X1 RBstart,X1 | Fc,DL,Y | CBWY | [TBD] | >ACLR(1 or 2) | | nX | nY | Fc,UL,X | CBWX | SCSx | LCRB,x2 RBstart,X2 | Fc,DL,Y | CBWY | [TBD] | C-IM (optional) |   **Proposal 3: For MSD due to harmonic interference, keep 1 test point per NR-CA combination for direct harmonic hit, and 1 test point for near miss cases based on WF [1] option 1 table format as shown in Table 2 below**  Table 2: Proposal to simplify MSD tables due to harmonic interference for NR-CA.   |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | **UL band** | **DL band** | **UL Fc** | **UL BW** | **SCS of UL band** | **UL RB Allocation** | **DL Fc** | **DL BW** | **MSD** | **UL/DL harmonic order** | | **(MHz)** | **(MHz)** | **(kHz)** | **LCRB** | **(MHz)** | **(MHz)** | **(dB)** | | nX | nY | TBD | 5 | 15 | 25 (RBstart=0) | TBD | 5 | 23.5 | UL2/DL1 | |
| R4-2205282 | Huawei, HiSilicon | **Summary of change:**  **1. To replace the MSD test configurations by using new format table for CA\_n3-n74/CA\_18-n28/CA\_n3-n34/CA\_n46-n78/CA\_n41-n77.**  **2. To specify the MSD for CA\_n1-n3 and CA\_n1-n40 due to the “ACLR1/ACLR2” interference.** |

## Open issues summary

### Sub-topic 2-1

*Sub-topic description: Based on the approved WF R4-2202287, companies provided their views on the open issues in this meeting. We’d like to discuss them and make some progress in this meeting.*

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

**Issue 2-1-1: How many test points should be restricted for a given MSD type and a given band combination?**

* Proposals
  + Option 1: When considering MSD table improvement for the harmonic or cross-band isolation (>ACLR2), two MSD requirements for a given MSD type and a given band combination can be considered at least, one for the minimum victim downlink channel bandwidth and the other for the largest victim downlink channel bandwidth.
  + Option 2: More than one MSD test point can be introduced for a given band combination based on the reasonable judgement, but the maximum number of MSD test point can be five and it’s allowed to test only one configuration.
  + Option 3:
    - For MSD due to cross-band isolation, keep 1 test point per NR-CA combination, and optionally, on a case-by-case basis, evaluate the necessity to retain one additional test point to account for C-IM interference.
    - For MSD due to harmonic interference, keep 1 test point per NR-CA combination for direct harmonic hit, and 1 test point for near miss cases
  + Option 4: Others
* Recommended WF
  + TBA

**Issue 2-1-2: The general table format for MSD due to cross band isolation is proposed as below.**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **UL band** | **DL band** | **UL Fc** | **UL BW** | **SCS of UL band** | **UL RB Allocation** | **DL Fc** | **DL BW** | **MSD** | **X band interference source** |
| **(MHz)** | **(MHz)** | **(kHz)** | **LCRB** | **(MHz)** | **(MHz)** | **(dB)** |
| nX | nY | Fc,UL,X | CBWX | SCSx | LCRB,X1 RBstart,X1 | Fc,DL,Y | CBWY | [TBD] | >ACLR(1 or 2) |
| nX | nY | Fc,UL,X | CBWX | SCSx | LCRB,x2 RBstart,X2 | Fc,DL,Y | CBWY | [TBD] | C-IM (optional) |

* Proposals
  + Option 1: Yes, it’s similar to what we have agreed in WF R4-2202287.
  + Option 2: Others
* Recommended WF
  + TBA

**Issue 2-1-3: Further discuss on candidate options for the format of MSD table due to harmonics.**

* Proposals
  + Option 1:

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **UL band** | **DL band** | **UL Fc** | **UL BW** | **SCS of UL band** | **UL RB Allocation** | **DL Fc** | **DL BW** | **MSD** | **UL/DL harmonic order** |
| **(MHz)** | **(MHz)** | **(kHz)** | **LCRB** | **(MHz)** | **(MHz)** | **(dB)** |
| nX | nY | TBD | 5 | 15 | 25 (RBstart=0) | TBD | 5 | 23.5 | UL2/DL1 |
|  | | | | | | | | | |

* + Option 2:

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **UL band** | **DL band** | **UL BW** | **SCS of UL band** | **UL RB Allocation** | **DL BW** | **MSD** | **UL/DL fc condition** | **UL/DL harmonic order** |
| **(MHz)** | **(kHz)** | **LCRB** | **(MHz)** | **(dB)** |
| nX | nY | 5 | 15 | 25 (RBstart=0) | 10 | 23.5 | Note1 | UL2/DL1 |
| Note 1: The requirements should be verified for UL EARFCN or NR ARFCN of the aggressor (lower) band (superscript LB) such that in MHz and  with carrier frequency in the victim (higher) band in MHz and the channel bandwidth configured in the lower band. | | | | | | | | |

* Recommended WF
  + TBA

**Issue 2-1-4: Discuss whether the same table format can be used for both Tx harmonic interference table and Rx harmonic mixing table**

* Proposals
  + Option 1: Yes, the same table format can be used.
  + Option 2: No, it should be discussed separately.
* Recommended WF
  + TBA

### Sub-topic 2-2

*Sub-topic description: The specific MSD values and configurations should be discussed for some band combinations.*

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

**Issue 2-2-1: MSD due to cross-band isolation (>ACLR2) for CA\_n18-n28**

* Proposals
  + Option 1: The proposed MSD test point:

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **UL band** | **DL band** | **UL Fc** | **UL BW** | **SCS of UL band** | **UL RB Allocation** | **DL Fc** | **DL BW** | **MSD** | **X band interference source** |
| **(MHz)** | **(MHz)** | **(kHz)** | **LCRB** | **(MHz)** | **(MHz)** | **(dB)** |
| n18 | n28 | 822.5 | 15 | 15 | 18 (RBstart=0) | 785.5 | 5 | 2.6 | >ACLR2 |

* + Option 2: Others.
* Recommended WF
  + TBA

**Issue 2-2-2: MSD due to cross-band isolation (ACLR1) for CA\_n1-n3**

* Proposals
  + Option 1: The proposed MSD test point:

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **UL band** | **DL band** | **UL Fc** | **UL BW** | **SCS of UL band** | **UL RB Allocation** | **DL Fc** | **DL BW** | **MSD** | **X band interference source** |
| **(MHz)** | **(MHz)** | **(kHz)** | **LCRB** | **(MHz)** | **(MHz)** | **(dB)** |
| n1 | n3 | 1945 | 50 | 15 | 270 (RBstart=0) | 1877.5 | 5 | 22.5 | ACLR1/2 |

* + Option 2: Others.
* Recommended WF
  + TBA

**Issue 2-2-3: MSD due to cross-band isolation (ACLR2) for CA\_n1-n40**

* Proposals
  + Option 1: The proposed MSD test point:

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **UL band** | **DL band** | **UL Fc** | **UL BW** | **SCS of UL band** | **UL RB Allocation** | **DL Fc** | **DL BW** | **MSD** | **X band interference source** |
| **(MHz)** | **(MHz)** | **(kHz)** | **LCRB** | **(MHz)** | **(MHz)** | **(dB)** |
| n40 | n1 | 2340 | 80 | 30 | 270 (RBstart=0) | 2167.5 | 5 | TBD | ACLR1/2 |

* + Option 2: Others.
* Recommended WF
  + TBA

### Sub-topic 2-3

*Sub-topic description: Based on the approved WF R4-2202287, there is an open issue that how to implement these changes. And in this meeting, company proposed to introduce simplifications to NR-CA MSD tables due to Cross-band isolation and due to Harmonics (UL or Rx harmonic mixing) in Release 17 and companies are encouraged to bring CRs at next meeting. In this topic, we need to discuss this topic.*

**Issue 2-3-1: Discuss how to introduce simplifications to NR-CA MSD tables due to Cross-band isolation and due to Harmonics (UL or Rx harmonic mixing) in Release 17 once the table format and the number of test points per type of MSD is agreed**

* Proposals
  + Option 1: Introduce simplifications to NR-CA MSD tables due to Cross-band isolation and due to Harmonics (UL or Rx harmonic mixing) in Release 17. Companies are encouraged to bring CRs at next meeting once the number of test points per type of MSD is agreed at this meeting.
  + Option 2: Other specific suggestions.
* Recommended WF
  + TBA

## Companies views’ collection for 1st round

### Open issues

Sub topic 2-1

|  |  |
| --- | --- |
| **Company** | **Comments** |
| ZTE | **Issue 2-1-1:**  We think option 1 is reasonable. For Option 2, what’s the reason for maximum 5 number MSD test points?  In addition, if the new channel bandwidths, expecially the new CBW> existing max.CBW, or new CBW< existing min. CBW, then does it mean the MSD test point would be revised accordingly?  **Issue 2-1-2 and 2-1-3:**  How the template reflect the test point as discussed in issue 2-1-1 of more than 1 MSD test point are adopted?  **Issue 2-1-4:**  Option 2: No, it should be discussed separately.  We don’t think the simplification/template we discuss here is going to change the structure of the MSD type, that is in current specficiation, different tables are used for harmonic, Rx harmonic mixing, cross-band isolation MSD. |
| Qualcomm | **Issue 2-1-1:**  Option 3.  **Issue 2-1-2:**  Option 1.  **Issue 2-1-3:**  Option 1 without the footnotes.  **Issue 2-1-4:**  Option 2. |
| Huawei | **Issue 2-1-1:**  Seems that we didn’t see the difference between option 1 and option 3. If companies have concerns on option 2, we are OK to go with option 3.  **Issue 2-1-2:**  Option 1. To ZTE, it’s just like what we do in Table 7.3A.2.2-1 from TS 38.101. Different rows can be used to specify more than one MSD test points.  **Issue 2-1-3:**  Option 1.  **Issue 2-1-4:**  Option 1. Generally, the same table format can be reused by both Tx and Rx harmonic MSD. |
| Skyworks | **Issue 2-1-1:**  Option 3. If agreed, we would like to establish general guidelines to assist proponents in how to conduct MSD analysis. We are sorry we were unable to complete in due time the guidelines proposal paper (R4-2206136 was withdrawn) which was intended to generalize the initial set agreed in WF R4-2202275.  **Issue 2-1-2:**  Option 1.  **Issue 2-1-3:**  Option 1. To ZTE, same view as HW. Eventhough not shown in these examples, the idea is to retain a maximum of 2 test points for MSD due to harmonics: 1 for direct hit, 1 for near miss (whenever applicable).  **Issue 2-1-4:**  Option 1: this is enabled by our proposal notation in last column of “ULx/DLy” since this notation is generic enough to cover all cases of harmonic interference MSD. Example UL2/DL3 could be used to capture 3rd DL Harmonic mixing with 2nd UL harmonic. Having said that, if there are strong objections, we are ok for either solution as long as we agree on reducing the number of test points. |
| CHTTL | **Issue 2-1-1:**  Option 1, also can accept more MSD requirements allowed ex: 5 test point as stated in option 2.  As option 1 and option 3 are not the same, we are not ok with option 3.  In option 1, the two MSD requirements are all for the direct hit case for the harmonic, one for the minimum victim downlink channel bandwidth and the other for the largest victim downlink channel bandwidth, with the reason mentioned in our paper. (Also same consideration for >ACLR2 for cross band isolation)  Option 3 only allows one test point, which is not align with the previous WF:  - Consider 1 or more relevant MSD test points for different victim CBWs.  - Introduce at least 1 MSD test point that is compatible with the highest CBW that is mandatory  The just miss case should be counted separately, as it is not specified for all the cases. Same as the C-IM, should be counted separately as well.  Regarding the question on when new smaller or larger CBW is introduced in later release, we think it is better that the test points are not revised. So we just focus on what CBW is maximum and what is minimum at the stage we introduced the requirement.  **Issue 2-1-2:**  Option 2: first we don’t understand what is >ACLR(1 or 2), which is different from the term used in sub-topic 2-2, second the term “C-IM” is not used in the spec anymore, and also we don’t understand why we need to put optional on it?  **Issue 2-1-3:**  Close to Option 2, as our understanding is usually RAN4 focus on the requirement and the condition, and the actual test point is left to RAN5.  As the harmonic mixing is preferred to be separate table, the expression of UL/DL harmonic order can be revised to better wording.  **Issue 2-1-4:**  Option 2 |

Sub topic 2-2

|  |  |
| --- | --- |
| **Company** | **Comments** |
| ZTE | **Issue 2-2-1/ Issue 2-2-2**  We think the two issues are related to issue 2-1-1.  In addtion, for **issue 2-2-2:**  Currently, the cross band isolation MSD for band n1-n3 are defined as:   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | NR Band / Channel bandwidth of the affected DL band | | | | | | | | | | | | | | | | UL band | DL band | 5 MHz (dB) | 10 MHz (dB) | 15 MHz (dB) | 20 MHz (dB) | 25 MHz (dB) | 30 MHz (dB) | 40 MHz (dB) | 50 MHz (dB) | 60 MHz (dB) | 70  MHz  (dB) | 80 MHz (dB) | 90 MHz (dB) | 100 MHz (dB) | | n1 | n3 | 3 | 2.2 | 1.9 | 1.7 | 1.6 | 1.5 | 1.4 |  |  |  |  |  |  |   However, 22.5dB MSD was proposed in Option 1, it is ~7x larger. What’s the reason? |
| MediaTek | Shall CA\_n18-n28 be removed since it’s being discussed in thread [109]? |
| Qualcomm | **Issue 2-2-1**  CA\_n18-n28 is being discussed in thread [109]. Also, where did 2.6dB MSD come from? For DL in lower sub block of n28A, the MSD is 4.5dB for 18RBs configured in the UL of band n18. For the upper sub-block n28B, MSD = 31dB for 18RBs.  **Issue 2-2-2**  2 Test points could be considered.  As per our contribution in [R4-2117294](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_101-e/Docs/R4-2117294.zip), CA\_n1-n3 MSD is 23.7dB for full UL configuration.  As per 38.101-3 (DC\_1\_n3), use MSD=17dB for maximum UL bandwidth and limited UL configuration.  **Issue 2-2-3**  2 Test points could be considered.  As per our contribution in [R4-2117294](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_101-e/Docs/R4-2117294.zip), CA\_n1-n40 MSD is 32.7dB for full UL configuration.  As per 38.101-3 (DC\_1\_n40), use MSD=21.5dB for maximum UL bandwidth and limited UL configuration. |
| Huawei | **Issue 2-2-1**  I’m OK to follow the outcome in thread [109].  **Issue 2-2-2**  To ZTE, just BCS0 is considered for current MSD requirements for CA\_n1-n3. For BCS1, band n1 can support 50MHz, so the 1st adjacent channel of band n1 may have an impact on band n3 Rx. That’s why we need so larger MSD.  To Qualcomm, two test points can be considered.  **Issue 2-2-3**  To Qualcomm, two test points can be considered. |
| Skyworks | We are Ok to discuss case by case MSDs, but for now we should focus on getting final agreements on issues 2-1-1 to 2-1-4. We anyway need to review all test points and that could be done at next meeting.  **Issue 2-2-1:**  Same view as Qualcomm and Mediatek, this is is treated in [109]. We deliberately did not propose the new format in [109] because the agreements were not yet reached in this BCS4 thread.  **Issue 2-2-2:**  This is a combination which could follow the agreed WF R4-2202275 guidelines. We don’t see the urgency to treat this test point until we reach agreement on preceding issues (2-1-1..2-1-4). We can either come back at next meeting or during round 2 to prepare a WF for next meeting based on R4-2202275 guidelines.  **Issue 2-2-3:**  This test point is fine with us, but it seems too early to discuss at this stage. We need to agree on generic guidelines for the configuration for the UL band and the DL affected band and we would like to get that refined at next meeting. |
| CHTTL | **Issue 2-2-2**  The current MSD requirements for ACLR1/2 for DC\_1\_n3 can be re-used here?  **Issue 2-2-3**  Similar comment as 2-2-2. |

Sub topic 2-3

|  |  |
| --- | --- |
| **Company** | **Comments** |
| ZTE | Still, it is unclear to us how to treat the running TPs/draft CR. Obviousely, it is not easy to convert the tables using the new MSD test point. It seems it would confict with the basket WID work. We need to come up with method to avoid the conflicts first. |
| Qualcomm | The top priority is to make sure the UL configuration and previous MSD values have not changed or at least the same test point be used in the new format. |
| Huawei | To ZTE and Qualcomm, since we have agreed to evolve MSD table smoothly and the MSD requirements for R16 and R15 band combinations can’t be changed right now, we have to use different table format for the MSD. For R15 and R16 band combinations, the original table should be used. For R17 forward band combination, new format table can be used. For basket WIs, since the TP template has been agreed in Rel-17, there is no need to convert it right now. The new table format can be used in R18 for basket WIs.  Step 1: At least, in this meeting, we can specify the new table format with some exemplary R17 band combinations.  Step 2: In May meeting, we can convert all other R17 band combinations into the new table format.  Step 3: As for when we can convert other R15/R16 band combinations into the new table format and use a unified table for a certain kind of MSD, it can be discussed in R18. |
| Skyworks | By order of priority, our view is that we should 1) in this meeting agree on issues 2-1-1 to 2-1-4 first, 2) then agree on generic guidelines to ensure we have common understanding on how both the UL band and the DL band should be configured depending on MSD type, 3) then bring draftCRs.  Step 2) could be partially triggered based on WF R4-2202275 guidelines, but there are missing guidelines to cover the case of cross-band isolation with large frequency distance separating the UL band from the DL affected band.  So for this meeting, priority is to close step 1 and possibly reach agreement on guidelines. |
| CHTTL | Since the R17 baskets is extended to June, and the first R18 spec is available in Dec. Maybe it will be better to convert the format in Sep, to avoid the on-going Rel.17 TPs/draft CRs? |

### CRs/TPs comments collection

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| R4-2205282 | ZTE: What’s the relationship between the new added table and the existing table? Shouldn’t only keep the new added table? |
| Qualcomm: It looks strange having 2 different formatted crossband noise tables. The top priority is to make sure the MSD values are correct. |
| To ZTE and Qualcomm, since we have agreed to evolve MSD table smoothly and the MSD requirements for R16 and R15 band combinations can’t be changed right now, we have to use different table format for the MSD. For R15 and R16 band combinations, the existing table should be used. For R17 forward band combination, new format table can be used. For basket WIs, since the TP template has been agreed in Rel-17, there is no need to convert it right now. The new table format can be used in R18 for basket WIs.  Step 1: At least, in this meeting, we can specify the new table format with some exemplary R17 band combinations.  Step 2: In May meeting, we can convert all other R17 band combinations into the new table format.  Step 3: As for when we can convert other R15/R16 band combinations into the new table format and use a unified table for a certain kind of MSD, it can be discussed in R18. |
| Skyworks: our view was to bring all changes in one CR, like the initiative ongoing for LTE MSD table simplification in thread [142]. This could be done at next meeting following discussion paper on guidelines and table proposal. |
|  |

## 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#2-1** | *Issue 2-1-1:*  *Two companies can go option 1 and Three companies support option 3. Considering the progress, moderator encourage companies to make compromise in 2nd round.*  *Tentative agreements:*  *Candidate options:*  *Recommendations for 2nd round:*  *Further discuss it in the WF.*  *Issue 2-1-2:*  *Seems that some clarification and revisions are needed for option 1.*  *Tentative agreements:*  *Candidate options:*  *Recommendations for 2nd round:*  *Proponent can further clarify and revise option 1, otherwise we have to honor previous agreement in WF R4-2202287.*  *Issue 2-1-3:*  *Three company support option 1 and one company support option 2. Considering the progress, moderator encourage companies to make compromise in 2nd round.*  *Tentative agreements:*  *Candidate options:*  *Recommendations for 2nd round:*  *Further discuss it in the WF.*  *Issue 2-1-4:*  *Three companies support option 2 and two companies support option 1.*  *Tentative agreements:*  *Candidate options:*  *Recommendations for 2nd round:*  *Further discuss it in the WF.* |
| **Sub-topic#2-2** | *Issue 2-2-1:*  *It can follow the conclusion in thread [109].*  *Tentative agreements:*  *Candidate options:*  *Recommendations for 2nd round:*  *No further discuss it in the 2nd round.*  *Issue 2-2-2:*  *Tentative agreements:*  *Candidate options:*  *Recommendations for 2nd round:*  *Further discuss it in the WF.*  *Issue 2-2-3:*  *Tentative agreements:*  *Candidate options:*  *Recommendations for 2nd round:*  *Further discuss it in the WF.* |
| **Sub-topic#2-3** | *Moderator’s view: If we don’t convert the format in this meeting, I’m not sure we have TU to do it in next meeting.*  *Further discuss in the WF.* |

### CRs/TPs

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

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

## Discussion on 2nd round (if applicable)

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

**Subtopic 2-4: Discuss WF on improvements to MSD table.**

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Skyworks | We support WF\_v1 with the following comments:  **For MSD table due to Cross-band isolation – Issue 2-1-1, option 1.**  - We believe it is important we agree upon a set of guidelines how on to specify the MSD test points and how both the UL band and the DL affected band are configured. These guidelines will help migrate all MSD test points due to cross band isolation into the new MSD table format. For future combinations, it will help minimize the inconsistency issues we are currently experiencing across different test points. It is proposed to generalize the agreed WF R4-2202275 for that purpose.  - Our assumption is that the last column entitled “Xband interference source” is presented here only as an example as we believe different sources of interference may be specified. Example for CA\_n18-n28 we are discussing introducing an IMD3 and an IMD5 test point for cross-band. C-IM could be another source of interference. The new table format will be very useful to capture these test points.  **For MSD table due to harmonics Issue 2-3-2**  - About merging PC2 and PC3 into a single table: We would like to clarify that the intention is only to reduce the number of tables, i.e. it is only table merging that is proposed here. We still need to keep separate MSD test points for PC2 and PC3 with a footnote indicating to which power class does the test point apply. So, this recommended WF does not save any test point. Keeping separate tables is also fine with us if companies have some concerns. |
| Qualcomm | **Issue 2-1-1**  The 1st round discussion shows predominant support for **Option 3.** Our preference would be 2 test points that should not be restricted to the minimum and maximum downlink bandwidth.  **Issue 2-1-3**  Preferable to avoid footnotes.  **Issue 2-3-2**  An example showing table of combining PC2 and PC2 would be helpful and we would be open to combining for simplification. |
| Skyworks | *Please find our comments captured directly into WF* [Draft R4-2206450 WF on MSD improvement\_V6\_CHTTL\_SKWS](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_102-e/Inbox/Drafts/%5B102-e%5D%5B114%5D%20NR_BCS4_MSD_Inter_Band_ENDC/Round%202/Draft%20R4-2206450%20WF%20on%20MSD%20improvement_V6_CHTTL_SKWS.docx)  We propose a variant of option 1 to accommodate concerns and comments received off-line. We hope this is agreeable and will help move forward. |

**Subtopic 2-5: Discuss whether the revision of draft CR R4-2205282 (Draft CR for 38.101-1 to introduce new tables for MSD due to cross band isolation) is agreeable.**

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| **Company** | **Comments** |
| Huawei | Since comments were received offline, it is hard to agree this draft CR. It can be not pursued. No need further discussion. |
| ZTE | We prefer to transform the exising tables including all of the exsting combs into new tables. |
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# Topic #3: Discussion on CRs

## Companies’ contributions summary

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| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2203997 | ZTE Corporation | **Reason:**  BCS4/5 are allowed to be applied to new band combinations in RAN4 which indicate UE to support up to all of the channel bandwidths for the band in the band combination. BCS4 is release independent from Rel-15 while BCS5 is functionally equivalent to BCS4 except that the new Rel-17 signalling such as the limitation to the supporting channel bandwidth in each band within the band combination would apply. Note that the CRs for introduction of BCS4 and BCS5 have been agreed in RAN2 and RAN4, in order to capture the agreements related to the release independence for BCS4/5, a common text is suggested to be added for the configurations of NR-CA, NR-DC and SUL.  **Summary:**  Add a common text to clause 4 for NR-CA, NR-DC and SUL configurations to indicate the release independence of BCS4 and BCS5. |
| R4-2205281 | Huawei, HiSilicon | **Reason:**  In RAN4#101e meeting, RAN4 has agreed that BCS5 can’t be release independent from R15 from RAN4 perspective. Thus, the release independent method for BCS4 and BCS5 can be introduced.  Since BCS4/BCS5 is not applicable to intra-band ENDC, a clarification in clause 4 for general part may cause some amibiguity about applicability.  It’s better to clarify it in each sub-clause.  **Summary:**  Adds a note for NR-CA, NR-DC and SUL to indicate that configurations with BCSs other than BCS5 are release independent from Rel-15. However, configurations with BCS5 are Release independent from Rel-17. |
| R4-2205283 | Huawei, HiSilicon | **Reason:**  Since 70MHz for band n40 and 10/20/30/70/90 for band n79 were introduced into the spec, the MSD requirements for missing bandwidths should be introduced based on the latest WID revision Rp-213140.  The corresponding draft CR R4-2201253 has been endorsed in RAN4#101bis-e meeting.  **Summary:**  To introduce 10/20/30/70/90 MHz MSD due harmonic for DC\_8\_n79.  To introduce 70 MHz MSD due cross band isolation for DC\_1\_n40.  To introduce 70 MHz MSD due cross band isolation for DC\_7\_n40 |
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## Companies views’ collection for 1st round

### CRs/TPs comments collection

*Companies can comment the CR directly.*

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| --- | --- |
| **CR/TP number** | **Comments collection** |
| R4-2203997  VS  R4-2205281 | Qualcomm: support to have a general text to descript the BCS4/5 in TS38.307., i.e., R4-2203997. In addition, it depends on the discission in Topic#1.  ZTE2: During the discussion in last meeting, some companies raised their concerns if duplicated text is needed in multiple tables. Based on companies’ feedback, we move the content to common part in section 4. Regarding to the concern in Huawei’s CR R4-2205281, we suggest to add a wording to mention that BCS4/BCS5 is not applicable to intra-band EN-DC. Thus the note in common part will be simpler and without ambiguity. The suggested common text could be as follows:  “Configurations with BCSs other than BCS5 are release independent from Rel-15, where the BCSs for configurations are defined in TS 38.101-1 [2] and/or TS 38.101-3 [4]. Configurations with BCS5 are release independent from Rel-17, and BCS5 with signalling is allowed for early implementation from Rel-15. Note that BCS4/BCS5 is not applicable to intra-band EN-DC configurations.”  Huawei: OK with ZTE’s revision. |
| Company B |
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| R4-2205283 |  |
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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:* |

### 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”* |
| R4-2203997 | *Can be revised.* |
| R4-2205281 | *Can be merged into R4-2203997* |
| R4-2205283 | *Agreeable* |

## Discussion on 2nd round (if applicable)

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

**Subtopic 3-2: Discuss whether the revision of CR R4-2203997 (CR to TS 38.307 on Release independence of BCS4 and BCS5) is agreeable.**

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| **Company** | **Comments** |
| Huawei | We support this revision. Huawei and HiSilicon can cosign this CR. REV number can be 1 since it’s a formal CR. |
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**Subtopic 3-3: Discuss whether the CR R4-220xxxx (Big CRs to TS 38.101-1 for NR\_BCS4) is agreeable.**

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| **Company** | **Comments** |
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**Subtopic 3-4: Discuss whether the CR R4-220xxxx (Big CRs to TS 38.101-3 for NR\_BCS4) is agreeable.**

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| **Company** | **Comments** |
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# Recommendations for Tdocs

## 1st round

**New tdocs**

|  |  |  |
| --- | --- | --- |
| **Title** | **Source** | **Comments** |
| WF on … | YYY |  |
| LS on … | ZZZ | To: RAN\_X; Cc: RAN\_Y |
| *WF on improvements to MSD table* | *Huawei, HiSilicon* |  |
| *Big CRs to TS 38.101-1 for NR\_BCS4* | *Huawei, HiSilicon* | *To capture the contents of the endorsed CR R4-2200464 in last meeting and new MSD format.* |
| *Big CRs to TS 38.101-3 for NR\_BCS4* | *Nokia* | *To capture the contents of the endorsed CR R4-2200465 in last meeting.* |

**Existing tdocs**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Tdoc number** | **Title** | **Source** | **Recommendation** | **Comments** |
| R4-210xxxx | CR on … | XXX | Agreeable, Revised, Merged, Postponed, Not Pursued |  |
| R4-2203997 | CR to TS 38.307 on Release independence of BCS4 and BCS5 | ZTE Corporation | Revised |  |
| R4-2204053 | Discussion on the number of test points for the MSD table improvement | CHTTL | Noted |  |
| R4-2204486 | Max aggregated CBW for BCS4/5 | Nokia, Nokia Shanghai Bell | Noted |  |
| R4-2204509 | Discussion on maximum aggregated channel bandwidth for BCS4/5 | Qualcomm Incorporated | Noted |  |
| R4-2205117 | Discussion on the maximum aggregated bandwidth of intra-band CA for BCS4/5 | Xiaomi | Noted |  |
| R4-2205118 | TP for TR 38.862 to correct the maximum aggregated bandwidth for intra-band C CA with BCS4/BCS5 | Xiaomi | Noted |  |
| R4-2205280 | Discussion on simplifying extended MSD table | Huawei, HiSilicon | Noted |  |
| R4-2205281 | CR for 38.307 to introduce release independent method for BCS4/5 | Huawei, HiSilicon | Merged into the revision of R4-2203997 |  |
| R4-2205282 | Draft CR for 38.101-1 to introduce new tables for MSD due to cross band isolation | Huawei, HiSilicon | Revised |  |
| R4-2206142 | MSD Tables Simplification Proposal for BCS4 | Skyworks Solutions Inc. | Noted |  |
| R4-2205283 | CR for 38.101-3 to introduce MSD requirements for missing bandwidths. | Huawei, HiSilicon | Agreeable |  |
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Notes:

1. Please include the summary of recommendations for all tdocs across all sub-topics incl. existing and new tdocs.
2. For the Recommendation column please include one of the following:
   1. CRs/TPs: Agreeable, Revised, Merged, Postponed, Not Pursued
   2. Other documents: Agreeable, Revised, Noted
3. For new LS documents, please include information on To/Cc WGs in the comments column
4. Do not include hyper-links in the documents

## 2nd round

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| --- | --- | --- | --- | --- |
| **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 |  |
| R4-2206450 | WF on improvements to MSD table | Huawei, HiSilicon, Skyworks Solutions Inc. | Agreeable | *Skyworks Solutions Inc. cosign this paper.* |
| R4-2206451 | Big CRs to TS 38.101-1 for NR\_BCS4 | Huawei, HiSilicon | Agreeable |  |
| R4-2206452 | Big CRs to TS 38.101-3 for NR\_BCS4 | Nokia | Withdraw | *Draft version is not available before deadline* |
| R4-2206453 | CR to TS 38.307 on Release independence of BCS4 and BCS5 | ZTE Corporation | Agreeable | Revision of R4-2203997 |
| R4-2206454 | Draft CR for 38.101-1 to introduce new tables for MSD due to cross band isolation | Huawei, HiSilicon | Postponed | Revision of R4-2205282 |
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Notes:

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

# Annex

Contact information

|  |  |  |
| --- | --- | --- |
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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)