**3GPP TSG-RAN WG4 Meeting # 97-e R4-2016964**

**Electronic Meeting, 2-13 Nov., 2020**

**Agenda item:** 10.19

**Source:** Moderator (China Telecom)

**Title:** Email discussion summary for [97e][122] NR\_PC2\_CA\_R17\_2BDL\_2BUL

**Document for:** Information

# Introduction

This email discussion thread is related to NR PC2 CA basket WI, and will focus on the topic of following aspects:

* Topic #1: Work plan, TR skeleton and revised WID
* Topic#2: UE RF requirements
  + Issue 2-1-1: MSD for n77 PC2 combos
  + Issue 2-1-2: TPs for approval

Note that the table for filling comments is assigned just at the bottom of each section of issues.... But the table for collecting comments for CR/TP is still kept in the original position.

# Topic #1: Work plan, TR skeleton and revised WID

## Companies’ contributions summary

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| **T-doc number** | **Company** | **Proposals / Observations/Abstracts** |
| [R4-2015186](file:///E:\01%20标准\14%20HPUE\02%20UL_interCA\RAN4_97_e\Docs\R4-2015186.zip) | China Telecom | **Abstract**:This contribution provides the work plan for the WI. |
| [R4-2015187](file:///E:\01%20标准\14%20HPUE\02%20UL_interCA\RAN4_97_e\Docs\R4-2015187.zip) | China Telecom | **Abstract**:This contribution provides the TR skeleton v0.0.1. |
| [R4-2015188](file:///E:\01%20标准\14%20HPUE\02%20UL_interCA\RAN4_97_e\Docs\R4-2015188.zip) | China Telecom | **Abstract**:This contribution provides the draft TR v0.1.0, which was reserved for email approval and aims to reflect the TP approved in this meeting. |
| [R4-2015189](file:///E:\01%20标准\14%20HPUE\02%20UL_interCA\RAN4_97_e\Docs\R4-2015189.zip) | China Telecom | **Abstract**:revised WI to capture comments and new request from RAN4 reflector. |

## Open issues summary

*Before e-Meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies’ contributions.*

### Sub-topic 1-1: Work plan, TR skeleton and revised WID

This sub-topic will discuss rapporteur input for work plan, TR skeleton and revised WID.

**Issue 1-1-1: Work plan**

* Recommended WF
  + It is recommended to approve the work plan of R4-2015186

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| **Company** | **Comments** |
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**Issue 1-1-2: TR skeleton**

* Recommended WF
  + It is recommended to approve the TR skeleton of R4-2015187

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| **Company** | **Comments** |
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**Issue 1-1-3: Revised WIDss**

* Summarization for the WID revision
  + Add new objectives according to comments. The new objectives aims to specify requirements for 2band DL and 1band UL for both PC2 and PC1.5, which are the fallbacks of 2BDL/2BUL.
  + Add new combos requests from operators by considering the new revised objectives.
* Recommended WF
  + It is recommended to approve the new revised WID of R4-2015189

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| **Company** | **Comments** |
| Qualcomm | The WID revision includes PC1.5 UL CA band combinations. However, the PC1.5 WID that was recently completed only considered intra-band EN-DC, UL MIMO, and TxD. So UL CA has not been considered yet. Would this be a 3 simultaneous PA architecture with (26+26)+23? Is there anything that needs to be evaluated for this in a general sense before this gets put into a basket? |
| ZTE | Same concern with QC. Including PC1.5 will cause confusion due to the WID is for PC2. Also PC1.5 single carrier is achieved via dual Tx, means 3Tx to support UL CA. |
| CMCC | It is necessary to specify requirements for 2band DL and 1band UL as fallback of 2BDL/2BUL. |
| Huawei | PC1.5 needs further discussion to be added in the WI. If it was added, SAR discussion had to be facilitated with PC1.5 either. |
| China Telecom | We add PC1.5 for 2DL/1UL not 2UL in this WID, according to T-Mobile USA request and clarification in the reflector, which means only band combination requirements will be considered in this WID, rather than SAR issue. We are open to discuss. |

## 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:*  No comments on work plan and TR skeleton.  *Candidate options:*  *Recommendations for 2nd round:* Further discussion on the revised WID. |

*Recommendations on WF/LS assignment*

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

### CRs/TPs

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

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| **CR/TP number** | **CRs/TPs Status update recommendation** |
| [R4-2015186](file:///E:\01%20标准\14%20HPUE\02%20UL_interCA\RAN4_97_e\Docs\R4-2015186.zip) | Approved |
| [R4-2015187](file:///E:\01%20标准\14%20HPUE\02%20UL_interCA\RAN4_97_e\Docs\R4-2015187.zip) | Approved |
| [R4-2015188](file:///E:\01%20标准\14%20HPUE\02%20UL_interCA\RAN4_97_e\Docs\R4-2015188.zip) | for email approval |
| [R4-2015189](file:///E:\01%20标准\14%20HPUE\02%20UL_interCA\RAN4_97_e\Docs\R4-2015189.zip) | To be revised |

## Discussion on 2nd round (if applicable)

**Issue 1-1-3 (continual): Revised WID**

Concerns from companies: 2UL for PC1.5 shall be removed

Clarification from T-Mobile USA in Reflector: only 1UL for PC1.5 is cosidered.

Proposal: With above clarification, can we approve the revised WID R4-2015189?

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| **Company** | **Comments for issue 1-1-3 on 2nd round** |
| ZTE | Regarding the revised WID:  As commented by CMCC in 1st round, the fallback mode should be specified for PC2 2BDL/2BUL. We also didn’t find such information in the WID. It is not clear whether the PC2 2BDL/1BUL and/or the corresponding NR PC3 NR CA is the fallback mode for PC2 2BDL/2BUL. We tend to agree with CMCC that PC2 2BDL/1BUL should be specfied as the fallback mode of PC2 2BDL/2BUL, like PC3 NR CA.  Also, as we discussed in the last meeting, PC3 NR CA should be the pre-condition when proponent requesting the PC2 NR CA. It needs to include such information in the WID.  In our view, without the above information, we don’t know how to judge whether a certain combiantion is ok or not. It may cause problem when proponent requesting their PC2 combination.  In addition, we don’t think “configured transmitted power” needs to be studied for band combination, it is general requirement which is applicable for all the combinations. It is more proper to include it in SAR WID.  For the title, the WID title is only for 2 bands uplink, which means the 1 band UL is excluded. We suggest to correct the WID title as ”High power UE(power class 2) for NR inter-band Carrier Aggregation with 2 bands downlink and x bands uplink (x=1,2) ”. Otherwise, 1UL combination cannot be included, which means all the new added 1UL band combiantions are not allowed but it seems cannot be acceptable by operator.  For PC1.5:  It doesn’t belong to PC2. Also it seems the SAR issue needs to be considered. |
| LGE | Similar view with ZTE, RAN4 do not need to study “configured transmitted power” for PC2 UE. And prefer as ”High power UE(power class 2) for NR inter-band Carrier Aggregation with 2 bands downlink and 2 bands uplink ”.  Also, need to exclude PC1.5 discussion. |
| T-Mobile USA | There is no need to consider SAR for PC1.5. PC1.5 can only be considered for single uplink, not dual uplink as previously clarified. Single uplink SAR is already dealt with in the PC1.5 WI.  As for excluding PC1.5, since the WID will be covering PC2 for single uplink now, why not include PC1.5 for single uplink as well? It would seem to be an inefficient process to have to create a new WI just to handle the 2BDL/1BUL PC1.5 cases where everything is identical except for the power.  We agree with the suggestion from ZTE to change the name of the WID to “High power UE(power class 2) for NR inter-band Carrier Aggregation with 2 bands downlink and x bands uplink (x=1,2).”  As for “fallback,” it the UE indicates the capability for PC2 in the TDD band, the UE can fallback to PC2 for single uplink. However, PC2 should not be a mandatory “fallback.” |
| China Telecom | We also agree with ZTE suggestions to modify the WI title to adapt on the objectives of the WI. How about we revise the WID title in the next RAN plenary, since the corresponding WID code and TR title and budget time table need to be revised, under the assumption that no other contents need to be revised.  Regarding whether to capture PC1.5 single uplink, we have no strong opinion, but as mentioned by T-Mobile USA, it will be inefficient if creating a new basket WID for PC1.5. Also with large probability, the PC1.5 will be suggested to be covered in this WI if going to the RAN plenary.  Just wondering if companies still have strong comments on PC1.5 input. |

## Summary on 2nd round (if applicable)

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

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|  | **Status summary** |
| **Issue 1-1-3 (continual): Revised WID** | It seems no object on the revised WID after further clarification on 2nd round. The WID title needs to be modified in RAN plenary.  The original revised WID is recommended as approved.  The revised tdoc is recommended as withdrawn |

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| **CR/TP/LS/WF number** | **T-doc Status update recommendation** |
| [R4-2015189](file:///E:\\01%20标准\\14%20HPUE\\02%20UL_interCA\\RAN4_97_e\\Docs\\R4-2015189.zip) | approved |
| R4-2016853 | withdrawn |

# Topic #2: UE RF requirements

## Companies’ contributions summary

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| **T-doc number** | **Company** | **Proposals / Observations/Abstracts** |
| [R4-2015053](file:///E:\01%20标准\14%20HPUE\02%20UL_interCA\RAN4_97_e\Docs\R4-2015053.zip) | ZTE Corporation, CMCC | TP for TR38.xxx\_ PC2 CA\_n3A-n41A |
| [R4-2015054](file:///E:\01%20标准\14%20HPUE\02%20UL_interCA\RAN4_97_e\Docs\R4-2015054.zip) | ZTE Corporation, CMCC | TP for TR38.xxx\_ PC2 CA\_n28A-n41A |
| [R4-2015055](file:///E:\01%20标准\14%20HPUE\02%20UL_interCA\RAN4_97_e\Docs\R4-2015055.zip) | ZTE Corporation, CMCC | TP for TR38.xxx\_ PC2 CA\_n28A-n79A |
| [R4-2015056](file:///E:\01%20标准\14%20HPUE\02%20UL_interCA\RAN4_97_e\Docs\R4-2015056.zip) | ZTE Corporation, CMCC | TP for TR38.xxx\_ PC2 CA\_n40A-n41A |
| [R4-2016441](file:///E:\01%20标准\14%20HPUE\02%20UL_interCA\RAN4_97_e\Docs\R4-2016441.zip) | Qualcomm Incorporated | MSD values for PC2 UL CA for CA\_n2-n77, CA\_n5-n77, and CA\_n66-n77 are provided. Using more aggressive PCB isolation assumptions, it is demonstrated that the MSD can be signficantly improved making the combinations more suitable for operator deployment. Without these assumptions, the UE effectively cannot operate in a network under the condition of harmonic or 2UL IMD interference |

## Open issues summary

*Before e-Meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies’ contributions.*

### Sub-topic 2-1: UE RF requirements

This sub-topic will discuss UE RF requirements for proposed combinations.

**Issue 2-1-1: MSD for n77 PC2 combos**

* Proposals ([R4-2016441](file:///E:\01%20标准\14%20HPUE\02%20UL_interCA\RAN4_97_e\Docs\R4-2016441.zip))
  + Moderator understands this contribution proposed to use more aggressive assumptions for PC2 MSD calculation; otherwise the conventional assumptions based requirements are too poor to be useful for deployment.
* Recommended WF
  + Collect views on this discussion paper
  + If a WF or some agreements are necessary to align the new assumptions

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| **Company** | **Comments** |
| Verizon: | We support this type of discussions because the content of contribution provides a new method with assumptions to lower down the possible MSD values significantly. Without these new assumptions, the UE effectively cannot operate in a network under the condition of harmonic or 2UL IMD interference.  RAN4 should adopt the new assumptions in future NR CA and EN-DC works. |
| LGE | We think the 90dB PCB isolation is just derive to reduce MSD level for PC2 DC/CA UE.  In commercial UE, the 90dB isolation level is not possible to achieve the level in small UE form factor. Also NSA UE shall support both LTE and NR variable DC/CA band combinations at least 10 different operating bands. We are fine to revise simulation assumptions to derive MSD level for HPUE in Rel-17. However, RAN4 should consider reasonable PCB isolation level and commercial RF component performance. |
| CHTTL: | We share the similar view as Verizon.  And we think if the new assumption is agreed, then it should apply to all the UL NR CA and also EN-DC PC2 combination. |
| OPPO | In our understanding, the specification were defined based on the state of art UE design rather from making the requirements look better perspective. If the PCB isolation can be improved so much in commercial UE then we are fine to consider it, but this needs implementation justification.  Another point is that if this is difficult for smart phone, maybe can consider for large form factor UE like CPE? |
| Qualcomm | PCB isolation is never written as a requirement in the specification and it is not our intention to do that. It is only used as a parameter to derive MSD. From our understanding, real commerical small handheld phones are able to achieve MSD values that are comparable to ~90 dB isolation. This is not to say that the device actually achieves 90 dB isolation since there are other factors also to determine MSD. However, real devices can achieve this level of MSD performance so the specs should be written to more closely reflect this. |
| ZTE | A full picture of the new assumption for all the parameters may be needed due to except for the more aggressive PCB isolation, we wonder if there are other parameters (IPx (dBm)(x=2,3,4,5) )have more aggressive values?  Also, how to treat the existing MSD of PC3? It can be foreseen that the PC2 MSD with more aggressive assumption will be better than PC3 which may cause confusion if the more aggressive assumptions are not included in the spec.  Actually there are several RF components which will cause intermodulation, such as antenna switch, diplexer/triplexer, duplexer, filter, PA etc, sometimes dominated IMD products caused by antenna switch, duplexer or diplexer, and sometime dominated IMD products caused by PA, depending on different intermodulation types. It seems the better PCB isolation(~90dB) can only improve the IMD caused by PA but no effect on the IMD caused by antenna switch, diplexer/triplexer or diplexer.  Moreover, when discussing the MSD for LTE, if my memory is correct, the higher PCB isolation design is bottleneck means better PCB isolation may not easy to be achieved. Consequently, 60~70dB PCS isolation is used at that time.  For the proposal, we understand the intention, indeed high MSD values are not attractive by operator. So improving the MSD value is feasible. However, except for PCB isolation, we wonder if there is possible that more aggressive assumptions for the other component RF parameters such as IPx (dBm)(x=2,3,4,5) for antenna switch, diplexer, duplexer, triplexer, PA, except for PCB isolation. |
| Xiaomi | As commented in Email thread 123, MSD value is not directly used for BS deciding whether the band combination could be configurable or not in real deployment. In our view, the decisions for BS scheduling depends on actually channel quality not the MSD. Moreover, the MSD value in current spec is just the minimum requirements, which doesn’t preclude any UEs with better MSD.  The proposed improving MSD for PC2 is even 10dB smaller than that for PC3 for some band combination. This is difficult to do by smart phone. |
| China Telecom | We share the same view as Verizon and CHTTL.  We suggest to improve the general assumptions for MSD analysis, otherwise the MSD value is too larger and less meaningful for reference when deployment. |

**Issue 2-1-2: TPs for approval**

* Proposed TPs
  + R4-2015053, 15054, 15055, 15056
* Recommended WF
  + Collect the comments for proposed TPs in the section 2.3.1. If no comments for certain of TP, the TP will be recommended as approved in the summary for 1st round.

## Companies views’ collection for 1st round

### CRs/TPs comments collection

The following table aims to collect the comments for proposed TPs. If no comments for certain of TP, the TP will be recommended as approved in the summary for 1st round.

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| **CR/TP number** | **Comments collection** |
| R4-2015053 | CHTTL: The term “EN-DC” and “DC\_n3A\_n41A” are still used in Table 5.x.3.2-1 and Table 5.x.3.2-2, better to fix them? |
| ZTE: we can fix it in the revision. |
| Huawei: To be safe, put 2.3dB in brackets since it seems a bit stringent. |
| R4-2015054 |  |
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| R4-2015055 |  |
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| R4-2015056 |  |
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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:*  For Issue 2-1-1: MSD for n77 PC2 combos   * a WF is proposed for MSD assumptions improvement   For Issue 2-1-2: TPs for approval   * R4-2015053 needs to be revised based on comments * No comments on 15054, 15055, 15056   *Candidate options:*  *Recommendations for 2nd round:* Discussion on the WF for MSD improvement |

*Recommendations on WF/LS assignment*

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|  | **WF/LS t-doc Title** | **Assigned Company,**  **WF or LS lead** |
| #1 | WF on MSD assumptions improvement for UE PC2 combinations | [China Telecom] |

### CRs/TPs

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

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| **CR/TP number** | **CRs/TPs Status update recommendation** |
| R4-2015053 | To be revised to |
| R4-2015054 | approved |
| R4-2015055 | approved |
| R4-2015056 | approved |

## Discussion on 2nd round (if applicable)

### Sub-topic 2-1: UE RF requirements

**Issue 2-1-1: MSD for n77 PC2 combos**

This issue was captured in a WF. The informantion and recommended email thread for the WF discussion are shown in the table below.

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| **WF** | **Tdoc number assigned** | **WF/LS t-doc Title** | **Email thread recommended** | **Assigned Company,**  **WF lead** |
| #1 | R4-2016854 | WF on MSD assumptions improvement for UE PC2 combinations | [97e][122] NR\_PC2\_CA\_R17\_2BDL\_2BUL -WF-R4-2016854 | China Telecom |

This table below will collect the comments for the WF of R4-2016854. Moderator will copy the comments from email thread and paste into this table during summarizing the 2nd round discussion for well tracing the history.

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| **Company** | **Comments for MSD assumptions improvement in WF-R4-2016854** |
| OPPO | Some improvement from our side are as below.  The reason is that in the paper R4-2016441 and also the 1st page of WF it is clear that this MSD improvement is for the sake of reflecting good commercial UE ability to make the MSD meaningful for deployment. We are also support of this direction efforts, and think the good commercial UE ability should be considered in RAN4. Therefore, we suggest in the following discussions this improved MSD performance ability should base on commercial UE ability to make it close to the real products.  cid:image003.jpg@01D6B783.C7FA8090 |
| LGE | RAN4 need to study which PCB isolation is achievable level. Also can be further discuss on the other facts to improved MSD level for PC2.  However, the proposed WF is focus on [90dB] PCB isolation level. As I mentioned in 1st round, the PCB isolation should be considered the reasonable range from UE venders as same LTE-A CA and NR DC band combinations.  However, you ignore these performance in current stage. It should be discussed based on Vendor’s achievable levels, firstly.  So, LGE strongly concern the WF to improve MSD level with slide3 for PC2 UE. Also, do not need to specify separate MSD levels with different capability. |
| Nokia | Would you replace “The high MSD performance is” with “The improved MSD values are”?  “high MSD” looks a very bad value at first glance, though there is a “performance” after MSD so that it is possible to understand that better MSD value is intended.  We support this idea from QC. In terms of specification, this does not force all the UEs to meet better MSD values for every single band combination. This makes both UE and NW happier. If we did not introduce this capability, the UE with better performance would not be able to get opportunity to make maximum use of its ability, since network may not operate such band combination or even if the NW operates with the band combination, the scheduling must be very conservative. For instance, the UE which has improved MSD is only configured with the band combination when UL power is significantly lower and/or DL signal power is significant higher because network cannot distinguish good UE from band UE. |
| Verizon | We support this WF and support the Qualcomm contributions.  The MSD requirement is an important factor for the network planning, in which the standardized requirements will be firstly evaluated in the decision whether the band combination will be deployed or not. For meeting this, additional optimizations happened in the implementations. In fact the devices can be able to deliver very low MSD values practically in comparing the specified MSD values, and the implemented low MSD values have been significantly improved making the combinations to suitable the real deployments. The existing MSD without these improvements cannot be operated in networks. Also, the differences of the both specified MSD ranges and the implemented MSD values are very large.  Therefore, the new assumptions from Qualcomm for the MSD in requirements to both ENDC and NR CA PC2 UE are essential. RAN4 should accept the assumptions as a baseline for the enhancement. Also, we are interested in all of the other factors pointed out by companies, RAN4 should discuss and identify these requirements further as part of this WF too. |
| Qualcomm | One common theme from handset vendors is that the assumptions should reflect practically achievable performance from commercial designs. We think this is a reasonable request, but also remind that since this is indicated by capability signaling, it is not necessary that ALL UE’s can meet these requirements. It is understood that due to various tradeoffs, some UE’s will not be able to signal this capability. We suggest modifying the WF to include a bullet inviting companies to bring in MSD measurements on commercial or near-commercial devices so that we can evaluate what is feasible with commercial handsets. We suggest that Band 3 + Band n78 might be a good example since we are aware that several handsets support this combination. |
| Huawei | Thanks for the WF. It is a bit surprising though. We have a concern that still this basket work item is a placeholder for PC2 combinations where I think introducing UE capability for a new set of MSD requirements is not proper. We fully understand the intention that the operators like to see better UE MSD performance in order to have a better plan in certain combinations. Huawei also was proposing similarly in the past.  This WF has to be modified to address the below concerns:   1. We don’t accept new UE capability since it doesn’t work in terms of guaranteeing network deployment. No UE capability is introduced but study to enhance all MSD requirements not only for PC2 according to operator request for a certain combination; 2. This study and discussion is not proper to be carried out in a generic way. The discussion and study on enhancement is per combination case requested; 3. PC3 enhancement is with more importance in terms of guaranteeing network deployment thus PC3 has to be considered together. A separate new basket WI for PC3 combos is needed; 4. The enhancement is from Rel-17. |
| CHTTL | We share the same view as Verizon, and we are supportive of this WF. |
| Vivo | An optional MSD requirement means only part of UEs will support it. The network planning still has to base on the worse case: UE only support the mandatory MSD requirement. A new optional MSD seems questionable. The necessity of new optional MSD needs further clarification.  Regarding the assumption of PCB isolation increases from 60dB to 90 dB, it is reasonable or not and the impact to the MSD calculation modelling need FFS. |
| China Telecom | Thanks for the comments to this WF. If you take a look at the recent CRs for PC2 combos have IMD MSD issues. The MSD values for PC2 are several times higher than PC3, which we think does not reflect the real device performance or have less instruction as the requirements. That is the motivation for support the proposal and lead this WF.  Regarding the assumptions include 90 PCB iso, there are several companies have strong concern on this. I will remove this sub-bullet, to change the main bullet to improve MSD per band combination, also suggest to add the sub-bullet of inviting companies to bring MSD measurements and analysis based on their devices.  Regarding the capability reporting, actually this bullet is to some extent a compromise in case some devices don’t like to support better MSD. If companies have strong concern on this, let’s change to further discussion on whether introducing additional MSD capability reporting.  Please find the revised WID in the draft box as named: R4-201xxxx WF on MSD assumptions improvement\_OPPO\_QC\_CTC.pptx |
| MediaTek | In general we support the idea to improve MSD performance. However the PCB isolation 90dB requires special handling and the layout area in a smart phone is quite condensed that makes the criteria not feasible. We are also concerned, as other companies mentioned, PCB isolation shall not be the only assumption that requires improvement, components such as filter/duplexer/diplexer/switch…etc all need to be taken into consideration. Thus we have following view,   1. We don’t accept [90]dB PCB isolation as assumption since it is too optimistic. We propose [80]dB can be more practical assumption for aggressive PCB isolation and *this can never be general assumption for all MSD calculations*. It still requires special handling thus can only be band combination dependent. 2. We support 3rd bullet in the original WF that MSD improvement shall be optional and signalled as UE capability per band combination. 3. If the signalling capability was agreed, there shall be separate MSD tables or separate values with note clarification for improved performance mapping to uplink power class. 4. The enhancement starts from Rel-17 and onward. The enhancement shall not be release independent from previous release. |
| Verizon | In fact there is no an operator (worldwide) to plan their networks based on the worst case! Some companies’ comments are completely wrong.  We support the Qualcomm WF as the enhancement of MSD is a common request from operators. For meeting achievable performance, some existing assumptions will be updated. To minimize the possible impacts, it is not necessary that ALL UE’s should meet these requirements at beginning. |
| Apple | We have concerns with introducing tighter or improved PCB isolation assumptions. There are other factors influencing MSD as well (e.g. antenna, switches, filter, IMD etc.). Most important the benefit for the NW is not clear. If the new assumption is optional then not all UEs will support improved PCB isolation.  If the network is not planned on typical MSD but on improved MSD would this exclude typical UEs? Can the network benefit from better deployment or overall throughput? Does the network consider the capability when configuring the UE for certain UL/DL combination?  Regarding the WF we do not think that the approach of using commercial devices is a good one. We do not know which antennas, filters etc are implemented in the UEs and therefore cannot draw an underlying assumption from the values alone. Also, the final MSD from spec should contain some margins. Otherwise implementation might turn out to be very challenging. Furthermore, at the moment we do not favour the divide into good MSD and bad MSD UEs. Especially, as the benefit to the UE and network is not clear and the complexity for testing and implementation is considerably increased.  From this perspective we do not agree that a WF with the current goal should be adopted. |
| Qualcomm | We support the WF from CTC and we think this revised version reflects most of the concerns expressed. One question from Apple is on the network benefit. This question is probably best answered by operators who have more insight into network planning and deployment. However, in my understanding, the ability to have better performing devices in the network even if not all of them are better is that the better performing devices can be scheduled anywhere while the lesser performing devices can only be scheduled where there is no MSD overlap or may not even be possible to be configured for CA (single carrier only). While I’m not a network operator, it seems obvious to me that there will be potential network gain and the larger proportion of better performing devices, the higher the gain. Apple also commented that the approach of using commercial devices is not a good one; however, the assertion being made by the proponents is that commercial devices can significantly exceed 3GPP specified performance. How else can this assertion to clarified and quantified without looking at commercial devices. However, I do agree with perhaps the point that Apple is making that we should not rely solely on a few observations of commercial devices for a minimum requirement specification. Hence, this is a capability based requirement where the lesser performance for minimum requirement can still be derived based on worst case analysis as we’ve always done. |
| Verizon | Verizon supports the WF from CTC!  Also, we would like RAN4 to identify other impact factors for the PC2 MSD continually. |
| Apple | As already stated in the tdoc discussion we do not think that the WF on MSD assumption improvement should be done.  There are a lot of open question which have to be answered first.  We do not know which antennas, filters etc are implemented in the UEs and therefore cannot draw an underlying assumption from the values alone.  Also, the final MSD from spec should contain some margins. Otherwise implementation might turn out to be very challenging.  Most important, the benefit to the UE and network is not understood and the complexity for testing and implementation is considerably increased. |
| Verizon | Thanks for the message!  Very sorry! We are confused by your email and message as it is unclear for us what Apple's specific concern is and what type of information is trying to deliver here once we went through your messages? As you have mentioned about the type of antennas and filters in your email, could you specify in detail what their relationships are to the discussed MDS enhancement? If you believe we cannot draw an underlying assumption for PCB isolation here, what is your suggestion?  The target of this discussion is clear, i.e., the way forward on MSD assumptions improvement for UE PC2 combinations. We would like to understand Apple's inputs clearly. |
| China Telecom | We think most of concerns from each company have been tried to be addressed in the WF we uploaded in earlier time, although some companies commented after the draft uploaded. Regarding to provide measurement MSD, we are not sure if we have other option which can better reflect the actual MSD ability to define the requirement. Of course margin is allowed between the measurement results and requirements which is the convention way we keep doing in RAN4 for many requirements. With above clarification, I add a sub-bullet saying that margin is allowed between measurement result and requirement. |

**Issue 2-1-2: TPs for approval**

The table in 2.5.2 will collect the comments for revised TPs. Please the TP proponents make the revision available as soon in order to be reviewed by the companies who commented on 1st round.

### CRs/TPs comments collection

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| R4-2015053 -> R4-2016855 | Huawei: *no additional MSD requirements* means the MSD requirements are the same with those of what? DC or UL CA? PC3 or PC2? Can we have a clear clarification in the TP? |
| ZTE: To huawei, we correct is as:  *Comparing with PC3 CA\_n3A-n41A, no additional MSD are expected for this PC2 CA\_n3A-n41A with dual uplink carrier.*  Does it make sense? |
|  |

## Summary on 2nd round (if applicable)

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

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| --- | --- |
|  | **Status summary** |
| **Issue 2-1-1: WF on MSD** | Most of concerns have been addressed in the WF of R4-2016854. Thus it is recommended to approve the WF.  The WF is supported by China Telecom, Qualcomm, Verizon and CHTTL. |
| **Issue 2-1-2: TPs for approval** | With clarification from ZTE for the comment from Huawei, it is recommended to approve the TP R4-2016855 |

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| --- | --- |
| **CR/TP/LS/WF number** | **T-doc Status update recommendation** |
| R4-2016854 | Approved |
| R4-2016855 | Approved |