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

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

**Agenda item:** 10.19.1

**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%3A%5C01%20%E6%A0%87%E5%87%86%5C14%20HPUE%5C02%20UL_interCA%5CRAN4_97_e%5CDocs%5CR4-2015186.zip) | China Telecom | **Abstract**:This contribution provides the work plan for the WI. |
| [R4-2015187](file:///E%3A%5C01%20%E6%A0%87%E5%87%86%5C14%20HPUE%5C02%20UL_interCA%5CRAN4_97_e%5CDocs%5CR4-2015187.zip) | China Telecom | **Abstract**:This contribution provides the TR skeleton v0.0.1. |
| [R4-2015188](file:///E%3A%5C01%20%E6%A0%87%E5%87%86%5C14%20HPUE%5C02%20UL_interCA%5CRAN4_97_e%5CDocs%5CR4-2015188.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%3A%5C01%20%E6%A0%87%E5%87%86%5C14%20HPUE%5C02%20UL_interCA%5CRAN4_97_e%5CDocs%5CR4-2015189.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 WID**

* 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%3A%5C01%20%E6%A0%87%E5%87%86%5C14%20HPUE%5C02%20UL_interCA%5CRAN4_97_e%5CDocs%5CR4-2015186.zip) | Approved |
| [R4-2015187](file:///E%3A%5C%5C01%20%E6%A0%87%E5%87%86%5C%5C14%20HPUE%5C%5C02%20UL_interCA%5C%5CRAN4_97_e%5C%5CDocs%5C%5CR4-2015187.zip) | Approved |
| [R4-2015188](file:///E%3A%5C%5C01%20%E6%A0%87%E5%87%86%5C%5C14%20HPUE%5C%5C02%20UL_interCA%5C%5CRAN4_97_e%5C%5CDocs%5C%5CR4-2015188.zip) | for email approval |
| [R4-2015189](file:///E%3A%5C%5C01%20%E6%A0%87%E5%87%86%5C%5C14%20HPUE%5C%5C02%20UL_interCA%5C%5CRAN4_97_e%5C%5CDocs%5C%5CR4-2015189.zip) | To be revised |

## Discussion on 2nd round (if applicable)

## Summary on 2nd round (if applicable)

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

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

# Topic #2: UE RF requirements

## Companies’ contributions summary

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| **T-doc number** | **Company** | **Proposals / Observations/Abstracts** |
| [R4-2015053](file:///E%3A%5C01%20%E6%A0%87%E5%87%86%5C14%20HPUE%5C02%20UL_interCA%5CRAN4_97_e%5CDocs%5CR4-2015053.zip) | ZTE Corporation, CMCC | TP for TR38.xxx\_ PC2 CA\_n3A-n41A |
| [R4-2015054](file:///E%3A%5C01%20%E6%A0%87%E5%87%86%5C14%20HPUE%5C02%20UL_interCA%5CRAN4_97_e%5CDocs%5CR4-2015054.zip) | ZTE Corporation, CMCC | TP for TR38.xxx\_ PC2 CA\_n28A-n41A |
| [R4-2015055](file:///E%3A%5C01%20%E6%A0%87%E5%87%86%5C14%20HPUE%5C02%20UL_interCA%5CRAN4_97_e%5CDocs%5CR4-2015055.zip) | ZTE Corporation, CMCC | TP for TR38.xxx\_ PC2 CA\_n28A-n79A |
| [R4-2015056](file:///E%3A%5C01%20%E6%A0%87%E5%87%86%5C14%20HPUE%5C02%20UL_interCA%5CRAN4_97_e%5CDocs%5CR4-2015056.zip) | ZTE Corporation, CMCC | TP for TR38.xxx\_ PC2 CA\_n40A-n41A |
| [R4-2016441](file:///E%3A%5C01%20%E6%A0%87%E5%87%86%5C14%20HPUE%5C02%20UL_interCA%5CRAN4_97_e%5CDocs%5CR4-2016441.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%3A%5C01%20%E6%A0%87%E5%87%86%5C14%20HPUE%5C02%20UL_interCA%5CRAN4_97_e%5CDocs%5CR4-2016441.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.

|  |  |
| --- | --- |
| **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*

|  |  |
| --- | --- |
| **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)

## Summary on 2nd round (if applicable)

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

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