**3GPP TSG-RAN WG4 Meeting # 97-e R4-201xxxx**

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

**Agenda item:** 7.9.2 and 7.9.3

**Source:** Moderator (Samsung)

**Title:** Email discussion summary for [97e][216] NR\_eMIMO\_RRM

**Document for:** Information

# Introduction

*Briefly introduce background, the scope of this email discussion and provide some guidelines for email discussion if necessary.*

Rel-16 NR eMIMO WI (i.e., Enhancements on MIMO for NR) is a RAN1 leading WI with below major enhancement in RAN1 area, in which the following items are identified for having RAN4 RRM requirement impact, based on previous RAN4 discussion:

* Enhancements on multi-beam operation
	+ DL/UL beam indication with reduced latency and overhead
	+ Beam failure recovery for SCell
	+ L1-SINR measurement

In last RAN4 meeting (RAN#96e), main tasks within the RRM core work scope have completed. In the subsequent meetings, online discussion will focus on the eMIMO RRM performance requirement of the above aspects for Release-16.

*List of candidate target of email discussion for 1st round and 2nd round*

* 1st round: TBA
* 2nd round: TBA

As the rapporteur company for Rel-16 MIMO enhancement WI, we would like to suggest the following candidate target of 1st and 2nd round email discussion:

* 1st round: Collect more views on all topics and to get progress as much as possible:
* 2nd round: Based on results from 1st round, complete outstanding issues and reach the consensus for the WF.

# Topic #1: RRM Core Remaining Issues

*Main technical topic overview. The structure can be done based on sub-agenda basis.*

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2014244Discussion on RRM requirements for Multi-TRP | Apple | **Proposal #1: Update in MRTD requirements for NR CA that UE may assume that all signals from all CCs and multi-TRxP will be received within CP in intra-band contiguous CA scenario.** |

## 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

***RRM core requirement maintenance: correction and clarification***

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

**Issue 1-1-1: Clarification of multi-TRxP in MRTD requirements (section 7.6.4) for intra-band contiguous CA**

* Proposals (Apple): Update in MRTD requirements for NR CA that UE may assume that all signals from all CCs and multi-TRxP will be received within CP in intra-band contiguous CA scenario.
	+ Option 1: Support (MediaTek, Qualcomm, Apple)
	+ Option 2: Do not support (Nokia, Huawei, Ericsson)
* Recommended WF
	+ Based on the 1st round discussion. Companies may discuss on the necessity and the wording.

**Issue 1-1-2: Update the definition of PBFD and PCBD in NR-DC case when** **both PCell and PScell configured**

* Proposals (Apple): Update the definition of PBFD and PCBD (section 8.5) for SSB based CBD, CSI-RS based BFD and CBD in NR-DC with SCell.
	+ Option 1: Support (Apple,)
	+ Option 2: Other solutions (MediaTek, Qualcomm, Huawei)
* Recommended WF
	+ Companies’ views are collected in 1st round discussion.

**Issue 1-1-3: Clarification of L1-SINR reporting with CSI-RS based CMR and dedicated IMR configured**

* Proposals (Ericsson): update clarification on M=1 case when at least one of the two signalling configured.
	+ Option 1: Support (MediaTek, Qualcomm, Ericsson)
		- Option 1a: Support but wording needs update (Apple)
	+ Option 2: Do not support ( Huawei)
* Recommended WF
	+ Based on the 1st round discussion. Companies may discuss on the necessity.

**Issue 1-1-4: Clean up CR for RRM core requirement on L1-RSRP measurement procedure**

* Proposals (Samsung): Add the missing part for L1-RSRP measurement procedure which are previously agreed but missing due to ITU submission.
	+ Option 1: Support (MediaTek, Qualcomm, Huawei, Samsung, Ericsson, Apple, Nokia)
	+ Option 2: Do not support
* Recommended WF
	+ Companies’ views are collected in 1st round discussion. Other corrections may be added.

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
| MediaTek | Sub topic 1-1: Issue 1-1-1:We agree with Apple’s proposal because it is clearer for reader to understand the MRTD applied to different scenarios, i.e., multi-TPxP.Issue 1-1-2:More discussion is needed. For Apple’s proposal, the same factor is applied to SCell and PSCell in NR-DC. In our understanding, PSCell is more important than SCell, thus the PSCell’s factor would be different with SCell’s.Issue 1-1-3:We agree with Ericsson’s proposal Issue 1-1-4: We agree with Samsung’s proposal for clearer definition. |
| Nokia | Sub topic 1-1: Issue 1-1-1:The agreement captured in the RAN4 RRM chairman report is an assumption (not a requirement):“UE may assume that all signals from multi-TRxPs of the same serving cell will be received within CP in intra-band contiguous CA scenario”Thus, it is not necessary to capture such an assumption in the specification. Issue 1-1-2:Can you elaborate on why 1 is added to PBFD and PCBD?Issue 1-1-3:As the proposed changes in the CR (R4-2015826) alter the meaning of the original text, some clarifications are needed.Issue 1-1-4The proposal is OK. |
| **Qualcomm** | Issue 1-1-1:Agreeable as Apple’s proposal captures the Chairman’s note.Issue 1-1-2:Can we pls clarify if the assumption is as below for NRDC?1 searcher is reserved for PCELL; the other searcher is shared for PSCELL and all of the SCELLs? We agree with MTK if we shall favor PSCELL by equally sharing the searcher with all of the SCELLs. E.g PCBD for PSCELL is (1+numberofbands)/2 and PCBD for SCELLS is (1+numberofbands)/2?Issue 1-1-3: Agreeable, to clarify the conditions of M=1Issue 1-1-4: Agreeable |
| Apple | Sub topic 1-1: Issue 1-1-1: We propose to capture the assumption in spec, otherwise its not clear, especially for intra-band contiguous CA where we don’t have MRTD requirement and the assumption with mTRP is not obvious.Issue 1-1-2: [To Nokia] 1 is added because in NR-DC we have 1 PSCell and could have multiple SCells for BFD/CBD. The earlier scaling factor was just number of SCells, without accounting for PSCell. The assumption is searcher is shared between PSCell and SCells, hence 1+#bands for PScell and SCells for NR-DC.[To MTK, QC] We have 1 for PCell and 1+PBFD for PScell and SCells assuming shared searcher between PSCell and SCells. If SCell is configured for BFD along with PScell, we are not sure we can prioritize one over the other. Issue 1-1-3: We don’t see why ‘or’ should be changed to ‘and’. Suggest the following: …at least one of the higher layer parameters *timeRestrictionForChannelMeasurement* or *timeRestrictionForInterferenceMeasurements* is configured, **--Update 11/4—**Issue 1-1-1: The agreement in last meeting was for intra-band contiguous CA where we don’t have MRTD requirements. Hence we would like to clarify that for intra-band contiguous CA all signals from all TRP and CCs are received within CP. For all other scenarious the current MRTD requirements suffice. Issue 1-1-2:To HW: In NR-DC we have PCell and PSCell which is not accounted for in the current requirements. If searcher is shared between PCell and PScell, should we have P\_BFD = 2 for NR-DC for PScell and PScell? Searcher shared between PScell and Scell seems more likely and reasonable to us. Issue 1-1-3: To Ericsson I believe the wording should be –“… either of the higher layer parameters *timeRestrictionForChannelMeasurement* or *timeRestrictionForInterferenceMeasurements* are configured.”  |
| Huawei | Issue 1-1-1:The proposal seems different with the agreement captured in chairman notes.* The agreements in chairman notes: UE may assume that all signals from multi-TRxPs of the same serving cell will be received within CP in intra-band contiguous CA scenarios.
* The proposal: UE may assume that all signals from all CCs and multi-TRxP will be received within CP in intra-band contiguous CA scenario

This agreement only mentions that signals from same serving cell will be within CP. But the proposal restricts that signals from all CCs will be within CP.RAN4 has discussed the impacts of multi-TRxP transmission on MRTD/MTTD requirements for several meeting cycles. It has been agreed in last meeting that no RRM core requirement impact is identified on MRTD/MTTD requirements, which has been captured in WF R4-2012146. It is RAN4 common understanding that MRTD/MTTD requirements in clauses 7.5.3, 7.6.3 and 7.6.4 is sufficient for support the deployment with multi-TRxP transmission. So, there is no need to add the clarification.Issue 1-1-2:In NR-DC, if the UE shares BFD/CBD measurement opportunities between PSCell and SCell, it means that the BFD/CBD measurement requirements on PSCell in Rel-16 will be degraded by compared with the requirements in Rel-15. That is the reason why the UE does not share BFD/CBD measurement opportunities between PSCell and SCell in NR-DC.So, there is no need to update the definition of PBFD and PCBD.Issue 1-1-3:From my side, there is no misunderstanding based on the original wording. We need to focus on the technique issues.Issue 1-1-4:Agree with Samsung’s proposal. |
| Ericsson | Sub topic 1-1:Issue 1-1-1:As we concluded in RAN4#96-e, we don’t need any additional description in TS38.133. TS38.133 7.6.4 specifies the relation between two carriers, but we think the existing MRTD requirement is applicable for CA with multi-antenna transmission including ‘multi-TRxP deployment’.RAN1 agreed that all signals from transmission antennas in multi-TRP feature will be received within a CP, and this is same assumption as Rel-15 MIMO. This is the reason RAN1 does not introduce the terminology like ‘multi-TRxP deployment’ in TS38.21x.  Issue 1-1-3:[To Apple] The relation between M and CMR/IMR measurement restriction configurations are given as follows:

|  |  |  |
| --- | --- | --- |
|  |  | CMR measurement restriction(timeRestrictionForChannelMeasurement) |
|  |  | Not configured | Configured |
| IMR measurement restriction(timeRestrictionForInterferenceMeasurements) | Not configured | MCMR=3, MIMR=3 | MCMR=1, MIMR=1 |
| Configured | MCMR=1, MIMR=1 | MCMR=1, MIMR=1 |

Considering the table, we would like to revise texts as follows:- M=1 shall be applied if- aperiodic NZP-CSI-RS as CMR or dedicated IMR, or- aperiodic CSI-IMR as dedicated IMR, or- periodic and semi-persistent NZP-CSI-RS as CMR or dedicated IMR and ~~at least one of~~ higher layer parameters *timeRestrictionForChannelMeasurement* and/or *timeRestrictionForInterferenceMeasurements* is configured, or- periodic and semi-persistent CSI-IM as dedicated IMR and ~~at least one of~~ higher layer parameters *timeRestrictionForChannelMeasurement* and/or *timeRestrictionForInterferenceMeasurements* is configured;Issue 1-1-4:We are fine with this proposal.  |
| Samsung | Sub topic 1-1: Issue 1-1-3: It’s OK. We think the original wording seems not a problem, while the updated version might be clearer.Issue 1-1-4: Support. Previously agreed CR but not implemented in the spec.  |

### CRs/TPs comments collection

*Major close-to-finalize WIs and Rel-15 maintenance, comments collections can be arranged for TPs and CRs. For Rel-16 on-going WIs, suggest to focus on open issues discussion on 1st round.*

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| R4-2014245Apple | Company A |
| Company B |
|  |
| R4-2014246Apple | Company A |
| Company B |
|  |
| R4-2015826Ericsson | Ericsson: Would like to revise it according to the discussion. |
| R4-2016029Samsung |  |

## Summary for 1st round

### Open issues

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

|  |  |
| --- | --- |
|  | **Status summary**  |
| **Sub-topic#1-1** | **Issue 1-1-1: Clarification of multi-TRxP in MRTD requirements (section 7.6.4) for intra-band contiguous CA*** Proposals (Apple): Update in MRTD requirements for NR CA that UE may assume that all signals from all CCs and multi-TRxP will be received within CP in intra-band contiguous CA scenario.
	+ Option 1: Support (MediaTek, Qualcomm, Apple)
	+ Option 2: Do not support (Nokia, Huawei, Ericsson)

*Tentative agreements: N/A**Moderator’s opinion: Supporting companies may need to find a compromise solution. Or otherwise it can hardly make progress. And please pay more attention to performance part.* *Recommendations for 2nd round: Continue email discussion in the 2nd round.* **Issue 1-1-2: Update the definition of PBFD and PCBD in NR-DC case when** **both PCell and PScell configured** * Proposals (Apple): Update the definition of PBFD and PCBD (section 8.5) for SSB based CBD, CSI-RS based BFD and CBD in NR-DC with SCell.
	+ Option 1: Support (Apple,)
	+ Option 2: Other solutions (MediaTek, Qualcomm, Huawei)

*Tentative agreements: N/A**Moderator’s opinion: It seems an issue related to overlapping area of two WIs. Supporting company may need to further justify the motivation. And please pay more attention to eMIMO performance part.* *Recommendations for 2nd round: Continue email discussion in the 2nd round.* **Issue 1-1-3: Clarification of L1-SINR reporting with CSI-RS based CMR and dedicated IMR configured*** Proposals (Ericsson): update clarification on M=1 case when at least one of the two signalling configured.
	+ Option 1: Support (MediaTek, Qualcomm, Ericsson)
		- Option 1a: Support but wording needs update (Apple)
	+ Option 2: Do not support (Huawei)

*Tentative agreements: This contribution could be agreeable.* *Moderator’s opinion: Revised according to companies’ comments if any.**Recommendations for 2nd round: Revise the wording if needed and upload in 2nd round.***Issue 1-1-4: Clean up CR for RRM core requirement on L1-RSRP measurement procedure*** Proposals (Samsung): Add the missing part for L1-RSRP measurement procedure which are previously agreed but missing due to ITU submission.
	+ Option 1: Support (MediaTek, Nokia, Qualcomm, Huawei, Samsung, Ericsson, Apple)
	+ Option 2: Do not support

*Tentative agreements: agreeable**Moderator’s opinion: This is a previous agreed CR.* *Recommendations for 2nd round: N/A* |

*Recommendations on WF/LS assignment*

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

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation**  |
| R4-2015826Ericsson | *Based on 1st round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”*Suggest to be revised according to the comments if needed in the meeting. |

## Discussion on 2nd round (if applicable)

### Sub-topic 1-1

*Open issues and candidate options before 2nd round:*

**Issue 1-1-1: Clarification of multi-TRxP in MRTD requirements (section 7.6.4) for intra-band contiguous CA**

* Proposals (Apple): Update in MRTD requirements for NR CA that UE may assume that all signals from all CCs and multi-TRxP will be received within CP in intra-band contiguous CA scenario.
	+ Option 1: Support (Apple)
	+ Option 2: Do not support (Ericsson, Nokia)
* Recommended WF
	+ Based on the 2nd round discussion. Supporting companies may need to find a compromise solution. Or otherwise it can hardly make progress.

**Issue 1-1-2: Update the definition of PBFD and PCBD in NR-DC case when** **both PCell and PScell configured**

* Proposals (Apple): Update the definition of PBFD and PCBD (section 8.5) for SSB based CBD, CSI-RS based BFD and CBD in NR-DC with SCell.
	+ Option 1: Support (Apple)
	+ Option 2: Other solutions
* Recommended WF
	+ Companies’ views are collected in 2nd round discussion. It seems an issue related to overlapping area of two WIs. Supporting company may need to further justify the motivation.

**Issue 1-1-3: Clarification of L1-SINR reporting with CSI-RS based CMR and dedicated IMR configured**

* Proposals (Ericsson): update clarification on M=1 case when at least one of the two signalling configured.
* Recommended WF
	+ Based on the 2nd round discussion. Discuss on the wording modification in 2nd round. Can be endorsed after no comments.

## Companies views’ collection for 2nd round

### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
| **Samsung** | Issue 1-1-3: Same as 1st round comments. Revised wording might be more accurate.  |
| Apple | **Issue 1-1-1: Clarification of multi-TRxP in MRTD requirements (section 7.6.4) for intra-band contiguous CA**Based on the discussion and agreements in previous meetings so far, the conclusion is that the current MRTD requirements are also applicable for multi-TRP deployment. Our CR addresses the assumption for intra-band contiguous CA with multi-TRP deployment. For this case we don’t have requirements for MRTD as its common understanding in RAN4 that signals are received with a fraction of a CP for this case. However, in the last meeting, an agreement was made as:UE may assume that all signals from multi-TRxPs of the same serving cell will be received within CP in intra-band contiguous CA scenarios.The above agreement doesn’t include signals from all TRPs of all CCs. In order to make it clear that no additional requirements are necessary for multi-TRP deployment, we prefer to clarify in 38.133 as:For intra-band contiguous NR carrier aggregation with multi-TRxP deployment on one or more serving cells, the UE shall receive signals for all serving cells and multi-TRxP within each serving cell within the cyclic prefix length of the largest SCS among serving carriers.**Issue 1-1-2: Update the definition of PBFD and PCBD in NR-DC case when** **both PCell and PScell configured** The current definition of PBFD and PCBDdoesn’t cover NR-DC where we have both PCell and PScell. Current definition is as:The values of PBFD used in Table 8.5.3.2-1 and Table 8.5.3.2-2 are defined as For each CSI-RS resource in the set  configured for PCell or PSCell- PBFD = 1,. For each CSI-RS resource in the set  configured for a SCell- PBFD is the number of band(s) on which UE is performing beam failure detection only for SCell.In NR-DC we have PCell and PScell and may be also SCell. We need to re-define PBFD and PCBD to cover the scenario where Pcell, PScell (and SCell) are configured. With the current definition the assumption is that same searcher is used for PCell and PScell, but both are not configured together and also that searcher is shared between all SCells. For NR-DC case, we need to share the searcher re- define PBFD and PCBD to cover the scenario.Once we agree that there is an issue, we can discuss further how to define PBFD and PCBD. We have the following options:Option 1: Searcher shared between PCell and PScell with equal priorityOption 2: Searcher shared between PSCell and SCells with equal priorityOption 3: Searcher shared between PSCell and SCells with higher priority for PScellWe are open to discuss further. |
| Ericsson | **Issue 1-1-1**As we discussed in the last meeting, we don’t want to add any changes in the current spec. Since the current MRTD requirements exists from Rel-10 LTE and it is applicable for CA/DC+MIMO scenario. We also think the current MRTD requirements are applicable to Rel-16 multi-TRxP features as far as it is assumed that all signals from multi-TRxPs of the same serving cell will be received within CP. So we don’t agree to change the spec. **Issue 1-1-3**We revised the wording as follows:For periodic or semi-persistent NZP CSI-RS or CSI-IM resource as dedicated IMR, M=1 if the higher layer parameters *timeRestrictionForChannelMeasurements* and/or *timeRestrictionForInterferenceMeasurements* are configured,Please check the revision R4-2017165 |
| MediaTek | Issue 1-1-1:We still support Option 1. It is helpful to clarify the requirement is also applicable to multi-TRxP scenario. And we also agree it should be no RRM core requirement impact. When CA is configured, there will be no performance degradation if all signals from all CCs and multi-TRxP be received within CP. However, if the signal is revised outside CP, there would be performance degradation. If Option 1 is not agreeable, we think it can clarify that performance degradation would occur when then signal is revised outside CP, as an compromise solution.Issue 1-1-2:We support option 2. We believe that the PSCell is more important than SCell and the PSCell shall be prioritized. We may follow the similar rule as carrier-specific scaling factor defined in clause 9.1.5 in TS 38.133. The new and for PCell, PSCell and SCell in NR-DC scenario are provided as follows.

|  |  |  |  |
| --- | --- | --- | --- |
| Scenario |  and for FR1 PCC |  and for FR2 PSCC |  and for FR1+FR2 SCC |
| **FR1 + FR2 NR-DC (FR1 PCell and FR2 PScell)**  | 1 | 2 | 2×Z |
| Note 1: Z is the number of band(s) on which UE is performing beam failure detection only for Scell |
|  |

Issue 1-1-3:No strong view on this issue. |
| Huawei | Issue 1-1-1:The MRTD is defined as the slot boundary difference between two CCs. The slot boundary of a cell with multi-TRxP transmission could be determine one TRxP of the cell, which is up to UE implementation. The agreement that signals from multi-TRxP of same serving cell within CP is sufficient and there is no need to update the current MTRD requirements. So, we support option 2, not support.Issue 1-1-2:For NR-DC in Rel-15, the UE shall be able to perform BFD/CBD measurements on both PCell and PSCell without any sharing factor. In Rel-16, the BFD/CBD performance on PCell and PSCell shall not be degraded compared with that in Rel-15. So, the values of PBFD and PCBD are defined as 1 for both PCell and PSCell.We support to keep the current definition. |
| Nokia, Nokia Shanghai Bell | Issue 1-1-1:Option 2 with the same technical reason provided as in the first round discussion. As mentioned, the agreement captured in the RAN4 Chairman notes is an assumption. It is because of this assumption, RAN4 agreed at the last meeting that there is no RRM core requirement impact identified on MRTD/MTTD values specified in Rel-15 for Rel-16 eMIMO multi-TRxP transmission. Further, the proposed text in the CR can cause confusion. In conclusion, there is no need to update the specification. Issue 1-1-2:Further clarification is useful to understand the rationale behind the proposed modification.  |
| Qualcomm | **Issue 1-1-1:**We agree with Apple to properly capture the UE assumption on MRTD requirement for intra-band contiguous CA properly in 38.133 7.6.4.Currently there is only one sentence regarding this as “For intra-band CA, only co-located deployment is applied.”. It doesnot mention if this applies to contiguous CCs of single TRP or multiple TRPs. Hence, we propose to update Apple’s proposal as below for a single serving cell, “For intra-band contiguous NR carrier aggregation with co-located multi-TRxP deployment on one serving cell [~~or more serving cells~~], the UE shall receive signals for [~~all serving cells and~~] multi-TRxP within each serving cell within the cyclic prefix length [~~of the largest SCS among serving carriers~~].”We are not sure whether it’s reasonable to assume multiple serving cells though. RAN4 can further discuss if this can be extended to multiple serving cells.**Issue 1-1-2:**We can support option2 to have the second searcher shared between PSCell and SCells with equal priority |

### CRs/TPs comments collection

*Major close-to-finalize WIs and Rel-15 maintenance, comments collections can be arranged for TPs and CRs. For Rel-16 on-going WIs, suggest to focus on open issues discussion on 1st round.*

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| R4-2014245Apple | Company A |
| Company B |
|  |
| R4-2014246Apple | Company A |
| Company B |
|  |
| R4-2017165Revision of R4-2015826Ericsson |  |

## Summary on 2nd round (if applicable)

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

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

# Topic #2: eMIMO RRM Performance General

*Main technical topic overview. The structure can be done based on sub-agenda basis.*

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2014756Discussion on RRM Performance part for Rel-16 NR eMIMO | Samsung | Proposal 1: RAN4 shall study on and complete Rel-16 eMIMO RRM performance part following the work scope in Table 1. |

## 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

***Work scope of RRM performance requirement***

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

**Issue 2-1-1: Work scope of RRM performance part**

* Proposals (Samsung): RAN4 shall study on and complete Rel-16 eMIMO RRM performance part following the work scope in the Table 1. (4756) (MediaTek, Nokia, Qualcomm, Apple, Huawei, Ericsson, Samsung)



* Recommended WF
	+ Companies’ views are collected in 1st round discussion. Companies may discuss on the scope and the impact on the spec.

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
| MediaTek | Sub topic 2-1: Issue 2-1-1: Agree with Samsung’s proposal.  |
| Nokia | The proposed work scope is OK.  |
| Qualcomm | Recommended WF is agreeable. |
| Apple | We are fine with work plan. |
| Huawei | Issue 2-1-1:Agree with Samsung’s proposal. |
| Ericsson | Support the moderator’s recommended WF. |
| Samsung | Sub topic 2-1: Issue 2-1-1: Work scope of performance part for discussion. Companies’ comments are welcomed.Besides, it seems a CR to 38.133 on Annex B.2 is needed. |

### CRs/TPs comments collection

*Major close to finalize WIs and Rel-15 maintenance, comments collections can be arranged for TPs and CRs. For Rel-16 on-going WIs, suggest to focus on open issues discussion on 1st round.*

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| XXX | Company A |
| Company B |
|  |
| YYY | Company A |
| Company B |
|  |

## Summary for 1st round

### Open issues

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

|  |  |
| --- | --- |
|  | **Status summary**  |
| **Sub-topic#2-1** | **Issue 2-1-1: Work scope of RRM performance part*** Proposals (Samsung): RAN4 shall study on and complete Rel-16 eMIMO RRM performance part following the work scope in the Table 1. (4756) (MediaTek, Nokia, Qualcomm, Apple, Huawei, Ericsson, Samsung)

*Tentative agreements: Agreeable* *Moderator’s opinion: Agree on R4-2014756**Recommendations for 2nd round: N/A* |

*Suggestion on WF/LS assignment*

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

### CRs/TPs

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

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

## Discussion on 2nd round (if applicable)

## Summary on 2nd round (if applicable)

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

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

# Topic #3: L1-SINR Measurement Accuracy

*Main technical topic overview. The structure can be done based on sub-agenda basis.*

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2014247Simulation results for L1-SINR Measurement accuracy | Apple | **Proposal #1: Define measurement accuracy for CMR based L1-SINR based on results from single shot measurement.****Proposal #2: Define measurement accuracy requirement for CMR based L1-SINR measurement as ±5 dB in FR1 and ±6.5 dB in FR2.** |
| R4-2014297Requirements for L1-SINR measurement accuracy | Qualcomm  | **Observation 1: Table 1 shows the statistics of L1-SINR simulation results in different scenarios.****Observation 2: Simulation results show +- 1.5 dB accuracy for all CMR + IMR scenarios and roughly +- 3 dB accuracy for CMR only scenarios.****Observation 3: The implementation margin for L1-RSRP measurement accuracy in FR2 is 1.5 dB higher than that in FR1.****Proposal 1: RAN4 uses following table to define the estimation accuracy requirements of L1-SINR.**

|  |  |  |
| --- | --- | --- |
|  | **FR1** | **FR2** |
| **CMR only** | **+- 5 dB** | **+- 6.5 dB** |
| **CMR + IMR** | **+- 3.5 dB** | **+- 5 dB** |

 |
| R4-2014603Discussion on L1-SINR measurement accuracy requirement | MediaTek | **Observation 1: For CMR only scenario, the L1-SINR measurement will become less inaccurate if either signal power is low (i.e. high SNR) or noise power is low (i.e. low SNR).****Proposal 1: For CMR only scenario, RAN4 need to evaluate L1-SINR accuracy requirement with side condition on Es/Iot = 25 dB, in addition to Es/Iot = -3 dB.****Proposal 2: For CMR only scenario L1- SINR for reporting, the absolute measurement accuracy is +/- 4.5 dB for FR1; +/- 4.5 dB for FR2 with side condition on CMR=-3dB.****Proposal 3: For SSB based CMR + NZP IMR L1-SINR for reporting, the absolute measurement accuracy is +/- 4 dB for FR1; +/- 4 dB for FR2 with side condition on CMR=-3dB and IMR=-3dB.****Proposal 4: For SSB based CMR + ZP-IMR L1-SINR for reporting, the absolute measurement accuracy is +/- 4 dB for FR1; +/- 4 dB for FR2 with side condition on CMR=-3dB and IMR=-3dB.****Proposal 5: For CSI-RS based CMR + NZP IMR L1- SINR for reporting, the absolute measurement accuracy is +/- 4 dB for FR1; +/- 4 dB for FR2 with side condition on CMR=-3dB and IMR=-3dB.****Proposal 6: For CSI-RS based CMR + ZP-IMR L1- SINR for reporting, the absolute measurement accuracy is +/- 4 dB for FR1; +/- 4 dB for FR2 with side condition on CMR=-3dB and IMR=-3dB.** |
| R4-2014758Simulation results summary for L1-SINR measurement accuracy | Samsung | **Summary of all submitted simulation results from interested companies for information.****It will be shared with companies for reference and submitted after all results updated** |
| R4-2014759Discussion on L1-SINR measurement accuracy requirement | Samsung | **Observation 1: Basically there are three levels of L1-SINR measurement accuracy for in total 5 scenarios: 1A, (2A, 2B), and (2C, 2D) respectively.****Observation 2: Very similar simulation results for L1-SINR measurement accuracy in both FR1 case and FR2 case.****Proposal 1: Under the normal condition, L1-SINR measurement accuracy is set to be +/-4.0dB for Scenario 1A; +/-3.5 dB for Scenario 2A and 2B; and +/-3.0dB for Scenario 2C and 2D.****Proposal 2: Under the extreme condition, L1-SINR measurement accuracy is set to be +/-5.0dB for Scenario 1A; +/-4.5 dB for Scenario 2A and 2B; and +/-4.0dB for Scenario 2C and 2D.****Proposal 3: Discuss on how to simplify the requirements scenarios/subsections in RAN4 for eMIMO performance part.** |
| R4-2015471Discussion on L1-SINR measurement accuracy requirements | Huawei, HiSilicon | **Proposal 1: It is suggested to define L1-SINR accuracy requirements based on the single shot L1-SINR measurement performance.****Proposal 2: It is suggested to define the L1-SINR accuracy requirements based on following five generalizes scenarios:*** + - **L1-SINR accuracy requirements with CSI-RS based CMR and no dedicated IMR configured**
		- **L1-SINR accuracy requirements with SSB based CMR and dedicated ZP-IMR configured**
		- **L1-SINR accuracy requirements with CSI-RS based CMR and dedicated NZP-IMR configured**
		- **L1-SINR accuracy requirements with SSB based CMR and dedicated ZP-IMR configured**
		- **L1-SINR accuracy requirements with CSI-RS based CMR and dedicated NZP-IMR configured**

**Proposal 3: For CMR only and CMR+ZP-IMR scenarios, the L1-SINR absolute accuracy requirements can be defined as +/-3.5dB under the side condition of CMR Es/Iot≥-3dB.****Proposal 4: For CMR only and CMR+ZP-IMR scenarios, the L1-SINR absolute accuracy requirements can be defined as +/-3.0dB under the side condition of CMR/IMR Es/Iot≥0dB.** |
| R4-2016239Simulation results of L1-SINR measurement accuracy | Nokia, Nokia Shanghai Bell | **The document has presented the simulation results of L1-SINR measurement accuracy for CMR-only, SSB+NZP-IMR, SSB+ZP-IMR, CSI-RS+NZP-IMR and CSI-RS+ZP-IMR.** |
| R4-2015827Simulation results of L1-SINR measurement accuracy | Ericsson | **Proposal 1: Derive L1-SINR measurement accuracy requirements based on the simulation results with M=1.****Proposal 2: After taking an average of companies simulation results, adopt the same methodology as L1-RSRP measurement accuracy to derive L1-SINR measurement accuracy requirements.** |

## 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 3-1

***Defining L1-SINR measurement accuracy requirement***

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

**Issue 3-1-1: Methodology for defining the L1-SINR accuracy requirements**

* Proposals
	+ Option 1: Reuse the same methodology of L1-RSRP requirement (Ericsson, Nokia)
	+ Option 2: Refer to the methodology of L1-RSRP requirement (MediaTek, Samsung, Intel)
		- Option 2a: The approach for SS-SINR should also be taken into consideration as well. (Nokia, Intel)
		- Option 2b: Only absolute measurement accuracy requirements for L1-SINR measurement. (Apple)
* Recommended WF
	+ Companies’ views are collected in 1st round discussion. The difference between defining absolute accuracy requirement and relative accuracy requirement could be discussed.

**Issue 3-1-2: Alignment of companies’ simulation result for L1-SINR accuracy requirement**

* Proposals: Companies could clarify their simulation results and try to align the results based on which the accuracy requirement could be defined.
* Recommended WF
	+ Companies’ views are collected in 1st round discussion. Companies may need to clarify their results first, because some companies’ results have comparatively larger gap to others.

**Issue 3-1-3: Accuracy requirements of L1-SINR under normal condition**

* Proposals
	+ Option 1: For Scenario 1A: ±5 dB in FR1 and ±6.5 dB in FR2; for CMR + IMR: ±3.5 dB in FR1 and ±5 dB in FR2 (Qualcomm)
		- Option 1a: same requirement for FR1 and FR2 for CMR only; Different for CMR+IMR. (Apple)
	+ Option 2: For Scenario 1A: ±4.5 dB in FR1 and ±4.5 dB in FR2; for CMR + IMR: ±4 dB in FR1 and ±4 dB in FR2 (MediaTek)
	+ Option 3: +/-4.0dB for Scenario 1A; +/-3.5 dB for Scenario 2A and 2B; and +/-3.0dB for Scenario 2C and 2D (Samsung)
	+ Option 4: +/-3.5dB for Scenario 1A, 2A and 2B; and +/-3.0dB for Scenario 2C and 2D (Huawei)
* Recommended WF
	+ Companies’ views are collected in 1st round discussion. Companies may support one of the options or propose their values in the comments.

**Issue 3-1-4: Difference of accuracy requirements of L1-SINR between FR1 and FR2**

* Proposals
	+ Option 1: No obvious difference as it is SINR (MediaTek, Huawei, Samsung, CMCC, Intel)
	+ Option 2: Consider RF margin 1.5dB higher for FR2 than FR1(Qualcomm)
		- Option 2a: Same RF margin for CMR only; 1.5 dB higher for FR2 (Apple)
* Recommended WF
	+ Companies’ views are collected in 1st round discussion.

**Issue 3-1-5: Accuracy requirements of L1-SINR under extreme condition**

* Proposals
	+ Option 1: 1dB higher for extreme condition than normal condition ( Samsung, Ericsson)
	+ Option 2: Other values (Qualcomm, Apple)
		- Option 2a: 2dB higher for extreme condition than normal condition (MediaTek)
* Recommended WF
	+ Companies’ views are collected in 1st round discussion.

### Sub-topic 3-2

***Settings for L1-SINR measurement accuracy requirement***

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

**Issue 3-2-1: Measurement samples for defining L1-SINR accuracy requirements**

* Proposals
	+ Option 1: L1-SINR accuracy requirements is defined based on the single shot L1-SINR measurement performance, i.e. M = 1. (MediaTek, Nokia, Qualcomm, Apple, Huawei, Ericsson, Samsung, Intel)
	+ Option 2: Other values.
* Recommended WF
	+ Support M = 1, i.e. L1-SINR accuracy requirements is defined based on the single shot L1-SINR measurement performance.

**Issue 3-2-2: Side condition of Ês/Iot for accuracy requirement**

* Proposals
	+ Option 1: -3dB for Scenario 1A, 2A and 2B; 0dB for Scenario 2C and 2D (MediaTek, Nokia, Qualcomm, Apple, Huawei, Ericsson, Samsung, Intel)
		- Option 1a: CMR Ês/Iot = -3dB for Scenario 1A, 2A and 2B; CMR Ês/Iot = 0dB and IMR Ês/Iot = 0dB for Scenario 2C and 2D. (Huawei)
	+ Option 2: -3dB for all scenarios
* Recommended WF
	+ Companies’ views are collected in 1st round discussion.

**Issue 3-2-3: Io condition of dBm/BWChannel for accuracy requirement**

* Proposals
	+ Option 1: Define accuracy requirement for “Max Io -50 dBm” only (MediaTek, Qualcomm, Huawei, Samsung)
	+ Option 2: Define accuracy requirement for “Max Io -70 dBm” and “Min Io -70 dBm + Max Io -50 dBm” (Ericsson)
* Recommended WF
	+ Companies’ views are collected in 1st round discussion.

### Sub-topic 3-3

***Spec structure for L1-SINR measurement accuracy requirement***

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

**Issue 3-3-1: Scenarios for L1-SINR measurement accuracy requirement in the spec**

* Proposals
	+ Option 1: Each scenarios (1A, 2A, 2B, 2C, 2D) for one sub-section. (Nokia, Qualcomm, Intel)
	+ Option 2: Simplify the scenarios/subsections for accuracy requirement
		- Option 2a: Combine scenarios with the same requirement and side condition into one subsection ([1A], [2A, 2B], [2C, 2D]). (MediaTek, Apple, Samsung, Intel)
		- Option 2b: [1A], [2A, 2C], [2B, 2D] (Huawei, Ericsson)
* Recommended WF
	+ Companies’ views are collected in 1st round discussion. Companies may propose their preference and the reason.

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
| MediaTek | Sub topic 3-1: Issue 3-1-1:We prefer to option-2. In option 1, the L1-RSRP measurement accuracy requirement for FR1 and FR2 are different because of RF margin. However, we do not need to consider the RF margin for L1-SINR measurement accuracy requirement in FR2 because the impact of RF modules will be cancelled while signal part divided by noise part.Issue 3-1-2:As we mentioned in Issue 3-1-1, for L1-SINR measurement, the impact of RF modules will be cancelled. Thus, the simulation results for FR1 and FR2 in CMR + IMR scenarios are similar. Issue 3-1-3:We suggest option-2. The L1-SINR measurement accuracy requirement for FR1 and FR2 shall be the same according to our discussion in Issue 3-1-1. In addition, we convert the simulated value into the nearest ceiling that is an integer multiple of 0.5 dB. Besides, an implementation margin of 2 dB is also added to each scenario.Issue 3-1-4:We suggest option 1 and the reason is provided in Issue 3-1-2.Issue 3-1-5:We prefer to option 2 and propose 2 dB higher for extreme condition than normal condition. Because, in L1-RSRP and SS-SINR measurement, the accuracy requirement under extreme condition is higher 2 dB and 1 dB than normal condition, respectively. Thus, consider the worst case between these two cases, we can take 2 dB for L1-SINR under extreme condition.Sub topic 3-2:Issue 3-2-1:We suggest option 1 because the worst case shall be considered while defining accuracy requirement.Issue 3-2-2:We suggest option 1 because we shall define the L1-SINR measurement accuracy based on the simulation assumption which the value of side condition is same as option 1.Issue 3-2-3:We slight prefer to option 1 because following the same logic as SS-SINR, the accuracy requirement is defined while Max Io is -50 dBm.Sub topic 3-3:Issue 3-3-1: We slight prefer to option 2a for conciseness. |
| Nokia | Sub topic 3-1: Issue 3-1-1:Can you elaborate on what the differences between the two options? L1-SINR is not the same as L-RSRP. Once the differences are known, then it is possible to determine what can be reused from L1-RSRP. The approach for SS-SINR should also be taken into consideration as well.Issue 3-1-2:If our simulation results do not align with others shown by the span analysis, an attempt will be made to align our simulation results. Issue 3-1-3:This depends on the outcome of Issue 3-1-1 (i.e., the selected methodology used to compute L1-SINR accuracy).Issue 3-1-4:This depends on the outcome of Issue 3-1-1. For option 2, the RF margin of 1.5 dB is based on L1-RSRP?Issue 3-1-5:This can be further discussed. Sub topic 3-2:Issue 3-2-1:It can adopt the same approach as L1-RSRP, i.e., M =1 (Option 1).Issue 3-2-2:Option 1 because the side condition is aligned with the agreed simulation assumptions. Issue 3-2-3:No strong preference. This depends on which methodology to use in Issue 3-1-1.Sub topic 3-3:Issue 3-3-1:This can be discussed once other issues are resolved. Based on the structure in CR (R4-2016240), it is Option 1. |
| Qualcomm | **Issue 3-1-1: Methodology for defining the L1-SINR accuracy requirements**Assume signal and noise are from the same source, the gain imperfection can be cancelled. However, if when the interference presents from a different Tx beam, it is subject to the gain accuracy issue still, which motivates us to adopt different implementation margins for FR1 and FR2.**Issue 3-1-2: Alignment of companies’ simulation result for L1-SINR accuracy requirement**We support different accuracy requirements for FR1 v.s FR2.**Issue 3-1-3: Accuracy requirements of L1-SINR under normal condition** Option1 is supported.**Issue 3-1-4: Difference of accuracy requirements of L1-SINR between FR1 and FR2**As we have established in Issue3-1-2 to allow 1.5dB higher margin in FR2**Issue 3-1-5: Accuracy requirements of L1-SINR under extreme condition**Option2 is supported.**Issue 3-2-1: Measurement samples for defining L1-SINR accuracy requirements**Option1 is supported for L1 measurement.**Issue 3-2-2: Side condition of Ês/Iot for accuracy requirement**Option1 is supported as the simulation results are derived assuming the same side conditions.**Issue 3-2-3: Io condition of dBm/BWChannel for accuracy requirement**Option1 is supported.**Issue 3-3-1: Scenarios for L1-SINR measurement accuracy requirement in the spec**Agree with Nokia that option1 is supported allowing each scenario can be tested. |
| Apple | Sub topic 3-1: Issue 3-1-1: We are also not clear about the options. We can have only absolute measurement accuracy requirements for L1-SINR measurement.Issue 3-1-3: We support option 1 with slight modification to have same reqt for FR1 and FR2. We understand that extra RF margin need not be added for SINR measurement.--11/4—We can have same reqt for FR1 and FR2 for CMR only, but need to have different for CMR+IMR. Issue 3-1-4: Option 1. ---Update 11/4 ---We added option 2aIssue 3-1-5: Option 1. ---Update 11/4—Option 2; Needs further discussion. Sub topic 3-2: Issue 3-2-1: We support the recommended WF.Issue 3-2-2: Option 1 is already agreed in simulation assumptions.Issue 3-2-3: Needs further discussionSub topic 3-3: Issue 3-3-1: We prefer option 2a in order to simplify spec. But the TC split is based on option 1.  |
| Huawei | Issue 3-1-3:We support option 4. The L1-SINR measurement accuracy is mainly related to the value of CMR Es/Iot, We suggest to define the same accuracy requirements for Scenario 1A/2A/2B, and define the same accuracy requirements for Scenario 2C/2D. Issue 3-1-4:We agree with option 1. RF margin does not need to be considered for L1-SINR measurement accuracy requirements.Issue 3-2-1:We can agree with the recommended WF.Issue 3-2-2:For scenario 2C/2D, the side conditions include CMR Ês/Iot and IMR Ês/Iot.We support option 1A: CMR Ês/Iot = -3dB for Scenario 1A, 2A and 2B; CMR Ês/Iot = 0dB and IMR Ês/Iot = 0dB for Scenario 2C and 2D.Issue 3-2-3:We support option 1, since only “Max Io -50 dBm” is defined for SS-SINR in NR and RS-SINR in LTE.Issue 3-3-1:In order to align with the structure of core requirements, we can agree with* Option 2b: [1A], [2A, 2C], [2B, 2D]

For each subsection with IMR is configured, the L1-SINR accuracy requirements with ZP-IMR and NZP-IMR will be separately defined by using separate Tables.Option 2b will make the reference in core requirements become easier. |
| Ericsson | Sub-topic 3-1Issue 3-1-1: What we need to decide is the additional margin for each scenario after the taking an average of companies simulation result. So we prefer option 1.It is straightforward to reuse the same margin when we derived L1-RSRP (R4-1904820). But L1-SINR takes a ratio of power estimates and noise estimates, which is different from L1-RSRP as some company comments. We are open to apply the different margin from L1-RSRP if it is reasonable.  Issue 3-1-2: Our simulation results in R4-2015827 is ideal results. The parameters are listed in the same Tdoc. Set SNR so that the ideal SINR becomes -3dB. Issue 3-1-3: It depends on the conclusion of 3-1-1.Issue 3-1-4: L1-RSRP considered RF margin 1.5dB higher for FR2 than FR1 because FR2 cannot compensate the RF impairments. If it is same for L1-SINR, we support option 2. If not, we support option 1. We need more inputs. Issue 3-1-5: Option 1. In LTE, RS-SINR in extreme condition set 1dB higher than that in normal condition. We can keep the same value. Sub-topic 3-2Issue 3-2-1: Support the moderator’s recommended WF, that is M=1. Issue 3-2-2: Option 1. Set the side condition so that the ideal SINR becomes -3dB. Issue 3-2-3: Option 2. Try to use the same requirements as L1-RSRP. Sub-topic 3-3Issue 3-3-1: Need clarification of proposal. We want to define clauses: * L1-SINR accuracy requirements with CSI-RS based CMR and no dedicated IMR configured,
* L1-SINR accuracy requirements with SSB based CMR and dedicated IMR configured,
	+ Including NZP-IMR and ZP-IMR
* L1-SINR accuracy requirements with CSI-RS based CMR and dedicated IMR configured,
	+ Including NZP-IMR and ZP-IMR

This is aligned with core requirements in 9.8.4.  |
| CMCC | **Issue 3-1-3: Accuracy requirements of L1-SINR under normal condition**For option 1 and option 2, we have one question for clarification. Does CMR+IMR in these two options includes both CMR+ZP\_IMR and CMR + NZP\_IMR? Measurement accuracy is related to the side condition. Since the side condition is different for scenario2A/2B and scenario2C/2D (also related to Issue 3-2-2), we are wondering why the same accuracy requirements are suggested for CMR+ZP\_IMR and CMR + NZP\_IMR?**Issue 3-1-4: Difference of accuracy requirements of L1-SINR between FR1 and FR2**Support Option 1. We also check with SS-SINR, there is no difference between FR1 and FR2, same approach can be used for L1-SINR. |
| Samsung | Sub topic 3-1: Issue 3-1-1: Option 2. Although the methodology for L1-RSRP and L1-SINR is quite similar, in our view it cannot be reused directly. Since SINR is a ratio rather than an absolute value as RSRP, we think the difference between different conditions will not be as large as RSRP requirement. So we could reuse the approach but discuss on the how much exactly the gap between conditions.[To Nokia and Apple]: Option 1 is proposed by Ericsson. They proposed use the same approach as well as same numerology to define L1-SINR as L1-RSRP. In our mind, at least the same numerology is should not be applied and we could discuss on the differences between. So that is option 2, i.e. do not use the exactly same method for L1-SINR. Issue 3-1-2: Let me clarify our simulation here: our simulation results is derived by the measured SINR minus the ideal SINR. Companies may need to clarify their results first, so that we could align our results. Some companies’ result may be from measured SINR minus the maximum, I guess?Issue 3-1-3: Support option 3, three levels for accuracy requirement. The detailed number may be determined after we discuss the following issues.Issue 3-1-4: From simulation results no big difference between different SCS. Although RF margin may be larger in FR2 than FR1, it will be not obvious in terms of SINR as mentioned that it is a ratio. So we prefer option 1.Issue 3-1-5: Prefer option 1. Extreme condition may cause more instable, so we could suppose a gap between. Also since it is SINR, it would not be a big difference. So we assume 1dB gap.Sub topic 3-2: Issue 3-2-1: Support M = 1. As it is a minimal requirement and we defined M=1 and M=3 in the core requirement for reporting. We think requirement should be based on M=1 simulation results.Issue 3-2-2: Prefer option 1 as it is simulation condition.Issue 3-2-3: Prefer option 1 as it is SINR not RSRP, Io would not have too much impact. If go with option 1, requirement may be slight relaxed.Sub topic 3-3: Issue 3-1-3: Prefer option 2a to simplify the scenarios as each group may have a same requirement. |
| Intel | Sub topic 3-1: Issue 3-1-1: RF margin for L1-RSRP is different for FR1 and FR2. L1-SINR calculation has already get rid of RF impact, which is similar with SS-SINR. Another question, for L1-RSRP, both absolute and relative accuracy are defined. Considering SS-SINR, only absolute accuracy requirement is defined for intra-frequency case. do we need to define relative accuracy requirement for L1-SINR?Issue 3-1-4: Option 1.Sub topic 3-2:Issue 3-2-1: Agree with recommend WF.Issue 3-2-2: Option 1.Sub topic 3-3-1:Issue 3-3-1: Both option 1 and option 2a are fine. |

### CRs/TPs comments collection

*Major close-to-finalize WIs and Rel-15 maintenance, comments collections can be arranged for TPs and CRs. For Rel-16 on-going WIs, suggest to focus on open issues discussion on 1st round.*

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| R4-2016240Nokia, Nokia Shanghai Bell | Company A |
| Company B |
|  |
|  | Company A |
| Company B |
|  |
|  |  |
|  |  |

## Summary for 1st round

### Open issues

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

|  |  |
| --- | --- |
|  | **Status summary**  |
| **Sub-topic#3-1** | **Issue 3-1-1: Methodology for defining the L1-SINR accuracy requirements*** Proposals
	+ Option 1: Reuse the same methodology of L1-RSRP requirement (Ericsson, Nokia)
	+ Option 2: Refer to the methodology of L1-RSRP requirement (MediaTek, Samsung, Intel)
		- Option 2a: The approach for SS-SINR should also be taken into consideration as well. (Nokia, Intel)
		- Option 2b: Only absolute measurement accuracy requirements for L1-SINR measurement. (Apple)

*Tentative agreements: Go with Option 2 and discuss details in the GTW.**Moderator’s opinion: Discuss issue 3-1-3 ~ 3-1-5 in the 1st round GTW session for details.**Recommendations for 2nd round: Continue discuss the methodology for accuracy requirement through email.***Issue 3-1-2: Alignment of companies’ simulation result for L1-SINR accuracy requirement*** Proposals: Companies could clarify their simulation results and try to align the results based on which the accuracy requirement could be defined.

*Tentative agreements: N/A* *Moderator’s opinion: Companies could clarify their results.* *Recommendations for 2nd round: Try to align the results as the fundamentals for defining the requirement***Issue 3-1-3: Accuracy requirements of L1-SINR under normal condition** * Proposals
	+ Option 1: For Scenario 1A: ±5 dB in FR1 and ±6.5 dB in FR2; for CMR + IMR: ±3.5 dB in FR1 and ±5 dB in FR2 (Qualcomm)
		- Option 1a: same requirement for FR1 and FR2 for CMR only; Different for CMR+IMR. (Apple)
	+ Option 2: For Scenario 1A: ±4.5 dB in FR1 and ±4.5 dB in FR2; for CMR + IMR: ±4 dB in FR1 and ±4 dB in FR2 (MediaTek)
	+ Option 3: +/-4.0dB for Scenario 1A; +/-3.5 dB for Scenario 2A and 2B; and +/-3.0dB for Scenario 2C and 2D (Samsung)
	+ Option 4: +/-3.5dB for Scenario 1A, 2A and 2B; and +/-3.0dB for Scenario 2C and 2D (Huawei)

*Moderator’s opinion: Key point of this issue is to decide how many levels for the accuracy requirements. After that we can derive the concrete number from the determined methodology. We can discuss in the 1st round GTW session for details.**Tentative agreements:* Discuss on How manylevels for accuracy requirement:* + Option 1 (QC, MTK): two levels [1A], [2A, 2B, 2C, 2D]
	+ Option 2 (SS): three levels [1A], [2A, 2B], [2C, 2D]
	+ Option 3 (HW): two levels [1A, 2A, 2B], [2C, 2D]

*Recommendations for 2nd round: Depends on companies’ view.***Issue 3-1-4: Difference of accuracy requirements of L1-SINR between FR1 and FR2*** Proposals
	+ Option 1: No obvious difference as it is SINR (MediaTek, Huawei, Samsung, CMCC, Intel)
	+ Option 2: Consider RF margin 1.5dB higher for FR2 than FR1(Qualcomm)
		- Option 2a: Same RF margin for CMR only; 1.5 dB higher for FR2 (Apple)

*Moderator’s opinion: We can discuss in the 1st round GTW session for details. Option 2a (difference between FR1 and FR2 for CMR only scenario) would be a compromise solution.**Tentative agreements:* Discuss on accuracy requirement difference between FR1 and FR2 * + Option 1: No obvious difference
	+ Option 2: FR2 1.5dB higher than FR1
	+ Option 3: Difference exists for CMR only scenario

*Recommendations for 2nd round: Depends on companies’ view.***Issue 3-1-5: Accuracy requirements of L1-SINR under extreme condition*** Proposals
	+ Option 1: 1dB higher for extreme condition than normal condition (Samsung, Ericsson)
	+ Option 2: Other values (Qualcomm, Apple)
		- Option 2a: 2dB higher for extreme condition than normal condition (MediaTek)

*Moderator’s opinion: We can discuss in the 1st round GTW session for details.**Tentative agreements:* Discuss in the GTW, extreme condition compared to normal condition* + Option 1: 1dB higher
	+ Option 2: other values (proponent could give their proposal)

*Recommendations for 2nd round: Depends on companies’ view.* |
| **Sub-topic#3-2** | **Issue 3-2-1: Measurement samples for defining L1-SINR accuracy requirements*** Proposals
	+ Option 1: L1-SINR accuracy requirements is defined based on the single shot L1-SINR measurement performance, i.e. M = 1. (MediaTek, Nokia, Qualcomm, Apple, Huawei, Ericsson, Samsung, Intel)
	+ Option 2: Other values.

*Moderator’s opinion: Agree on Option 1.**Tentative agreements:* L1-SINR accuracy requirements is defined based on the single shot L1-SINR measurement performance, i.e. M = 1.*Recommendations for 2nd round: N/A***Issue 3-2-2: Side condition of Ês/Iot for accuracy requirement*** Proposals
	+ Option 1: -3dB for Scenario 1A, 2A and 2B; 0dB for Scenario 2C and 2D (MediaTek, Nokia, Qualcomm, Apple, Huawei, Ericsson, Samsung, Intel)
		- Option 1a: CMR Ês/Iot = -3dB for Scenario 1A, 2A and 2B; CMR Ês/Iot = 0dB and IMR Ês/Iot = 0dB for Scenario 2C and 2D. (Huawei)
	+ Option 2: -3dB for all scenarios

*Moderator’s opinion: Agree on Option 1. Option 1a is a clarification for Option 1.* *Tentative agreements:* Side condition of Ês/Iot for accuracy requirement: -3dB for Scenario 1A, 2A and 2B; 0dB for Scenario 2C and 2D. (Same with simulation assumption)*Recommendations for 2nd round: N/A***Issue 3-2-3: Io condition of dBm/BWChannel for accuracy requirement*** Proposals
	+ Option 1: Define accuracy requirement for “Max Io -50 dBm” only (MediaTek, Qualcomm, Huawei, Samsung)
	+ Option 2: Define accuracy requirement for “Max Io -70 dBm” and “Min Io -70 dBm + Max Io -50 dBm” (Ericsson)

*Moderator’s opinion: We can discuss in the 1st round GTW session for details.**Tentative agreements:* Discuss on Io condition of dBm/BWChannel for accuracy requirement* + Option 1: “Max Io -50 dBm” only
	+ Option 2: “Max Io -70 dBm” and “Min Io -70 dBm + Max Io -50 dBm”

*Recommendations for 2nd round: Depends on companies’ view.* |
| **Sub-topic#3-3** | **Issue 3-3-1: Scenarios for L1-SINR measurement accuracy requirement in the spec*** Proposals
	+ Option 1: Each scenarios (1A, 2A, 2B, 2C, 2D) for one sub-section. (Nokia, Qualcomm, Intel)
	+ Option 2: Simplify the scenarios/subsections for accuracy requirement
		- Option 2a: Combine scenarios with the same requirement and side condition into one subsection ([1A], [2A, 2B], [2C, 2D]). (MediaTek, Apple, Samsung, Intel)
		- Option 2b: [1A], [2A, 2C], [2B, 2D] (Huawei, Ericsson)

*Moderator’s opinion: Prefer Option 2 to decrease the subsections. We can discuss in the 1st round GTW session for details.* *Tentative agreements:* Discuss on Spec structure for L1-SINR accuracy requirement* + Option 1: Each scenarios for one sub-section. (1A, 2A, 2B, 2C, 2D)
	+ Option 2: According to the conditions ([1A], [2A, 2B], [2C, 2D])
	+ Option 3: Align with the core requirement ([1A], [2A, 2C], [2B, 2D])

*Recommendations for 2nd round: Depends on companies’ view.* |

*Recommendations on WF/LS assignment*

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

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation**  |
| R4-2016240Nokia | *Based on 1st round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”*To be revised according to discussion conclusion. |

## Discussion on 2nd round (if applicable)

### Sub-topic 3-1

*Open issues and candidate options before 2nd round:*

**Issue 3-1-1: Alignment of companies’ simulation result for L1-SINR accuracy requirement**

* Proposals: Companies could clarify their simulation results and try to align the results based on which the accuracy requirement could be defined.
* Recommended WF
	+ Companies’ views are collected in 2nd round discussion. Companies may need to clarify their results first based on which we could discuss on the basic accuracy.

**Issue 3-1-2: Basic accuracy requirements of L1-SINR based on simulation assumption and results**

* Proposals: how to group the 5 scenarios based on simulation assumption and results? (Same group means the same **basic** accuracy requirement)
	+ Option 1: two levels [1A], [2A, 2B, 2C, 2D]
	+ Option 2: three levels [1A], [2A, 2B], [2C, 2D] (Samsung)
	+ Option 3: two levels [1A, 2A, 2B], [2C, 2D]
	+ Option 4: Other options
* Recommended WF
	+ Companies’ views are collected in 2nd round discussion. Besides the grouping, companies could also propose the accuracy value for each group.

**Issue 3-1-3: Difference of accuracy requirements of L1-SINR between FR1 and FR2 in CMR + IMR case**

* Proposals
	+ Option 1: No obvious difference as it is SINR (Samsung)
	+ Option 2: Consider RF margin [x]dB higher for FR2 than FR1(Apple)
		- Option 2a: X = 1.5 dB (Apple)
* Recommended WF
	+ Companies’ views are collected in 2nd round discussion. Companies could propose their value [x].

**Issue 3-1-4: Accuracy requirements of L1-SINR under extreme condition**

* Proposals
	+ Option 1: 1dB higher than for normal condition (Samsung)
	+ Option 2: 2dB higher than for normal condition
	+ Option 3: other values (Apple)
* Recommended WF
	+ Companies’ views are collected in 2nd round discussion.

**Issue 3-1-5: Scenarios for L1-SINR measurement accuracy requirement in the spec**

* Proposals
	+ Option 1: Each scenarios (1A, 2A, 2B, 2C, 2D) for one sub-section. (Apple)
	+ Option 2: Simplify the scenarios/subsections for accuracy requirement
		- Option 2a: Combine scenarios with the same requirement and side condition into one subsection ([1A], [2A, 2B], [2C, 2D]). (Samsung)
		- Option 2b: [1A], [2A, 2C], [2B, 2D], same as the core requirement.
* Recommended WF
	+ Companies’ views are collected in 2nd round discussion. Companies are encourage to select one as their preference so that we could endorse on the CR this meeting.

## Companies views’ collection for 2nd round

### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
| **Samsung** | **Issue 3-1-1:** After I checked R4-2014758, most companies’ simulation results are aligned. Our simulation results is derived by (the measured SINR minus the ideal SINR). Of course in this simulation we do not consider RF margin or fading, and the power in simulation is normalized in our simulation.Companies’ are supposed to clarify on this issue. If other companies’ results are also derived from [measured SINR minus ideal SINR], we can calculate a basic accuracy requirement based on which we could further consider FR gap or other factors.**Issue 3-1-2:** Based on the simulation results, we do think for Scenario 1A is the most inaccurate case for SINR estimation since no dedicated IMR, then 2A and 2B, where dedicated and side condition = -3dB, and most accurate case 2C and 2D where side condition = 0dB. Thus in our opinion there are 3 levels from observation of simulation results. For the concrete values, our preference is +/-4.0dB for Scenario 1A; +/-3.5 dB for Scenario 2A and 2B; and +/-3.0dB for Scenario 2C and 2D. The values could be further discussed after simulation results are aligned.**Issue 3-1-3:** As our analysed before, FR2 do not have an obvious difference. However, considering beams for FR2 is quite sharp and in the test we cannot precisely guarantee the signal and reference comes from same direction, we could compromise to 0.5dB higher requirement for FR2 CMR+IMR case.**Issue 3-1-4:** Prefer option 1. We knew some companies may argue that SS-SINR cannot be referred due to the number of measurement samples. Please check accuracy requirement for SS-RSRP, SS-SINR and L1-SINR in section 10, TS 38.133.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Condition/ Requirement | SS-RSRP | SS-SINR | L1-RSRP | L1-RSRP |
| Normal | 4.5 dB | 3 dB | 5 dB | ? |
| Extreme | 9 dB | 4 dB | 9.5 dB | ? |

To compare SS-RSRP with SS-SINR, though they all have multiple measurement samples, the gaps between normal condition and extreme condition in the two requirement are total different.To compare SS-RSRP with L1-RSRP, though they are different L3 vs. L1 measurement, the same logic is applied to L1-RSRP as SS-RSRP. (both are 4.5dB gap between)So we can follow the same logic to define the L1-SINR requirement w.r.t. the impact of extreme condition.As I analysed in GTW, the impact of measurement sample have been counted in the simulation with different M (M=1, 3, 5). Then the extreme condition means the temperature is too low or too high thus leading to be inaccurate because of unstable device. We cannot double count the M factor twice here. So we support use similar logic as SS-SINR. We do not think we should refer to L1-RSRP for this.**Issue 3-1-5:** Prefer option 2a. Also we could compromise to 2b.  |
| Apple | **Issue 3-1-2: Basic accuracy requirements of L1-SINR based on simulation assumption and results**We don’t have any preference on how to group results or requirements. We have agreed to define requirements for 5 cases, the discussion on number of levels doesn’t seem relevant.**Issue 3-1-3: Difference of accuracy requirements of L1-SINR between FR1 and FR2 in CMR + IMR case**Option 2 with X=1.5 dB. As we discussed in the GTW session, we think there will be some impact of making measurements at different time and the RF impairments/inequalities might not cancel out. We still prefer additional RF margin of 1.5 dB in FR2 for CMR+IMR case.**Issue 3-1-4: Accuracy requirements of L1-SINR under extreme condition**We prefer option 3. We need to further check on values.**Issue 3-1-5: Scenarios for L1-SINR measurement accuracy requirement in the spec**Option 1: We don’t think grouping requirements in anyway will have an impact on the spec or requirements. Each scenario or requirement will have a separate table/ requirement. |
| Ericsson | **Issue 3-1-1:**Our simulation results are ideal measured L1-SINR values (it is reported to the network after the quantization). This is the reason the median of our results (i.e., 50%-tile of CDF) is close to -3.0dB. It looks some other companies report the ‘accuracy’ so the 50%-ile of CDF is close to 0.We think this is one of the reasons of misalignment.  |
| MediaTek | Issue 3-1-1:As we discuss in first round, for CMR + IMR scenario, we do not think the additional RF margins is needed in FR2. Thus, the accuracy requirement for FR1 and FR2 will be similar.We are using “the measured SINR minus the ideal SINR”. Issue 3-1-2:We can agree with option 1 or option 2. And the corresponding values are provided for both options. * Option 1: For Scenario 1A: ±4.5 dB in FR1 and ±4.5 dB in FR2; for CMR + IMR: ±4 dB in FR1 and ±4 dB in FR2
* Option 2: For Scenario 1A: ±4.5 dB; for scenario 2A and 2B: ±4 dB; and for scenario 2C and 2D: ±3.5dB

In our understanding, the accuracy for CMR only scenario may be less accurate than CMR + IMR scenario, because the way to calculate L1-SINR are different.* For CMR+IMR scenario, the denominator of L1-SINR measurement is the total power measured on IMR resources (as agreed in R4-93), thus the uncertainty for interference part estimation can be low.
	+ RAN4 #93 Agreement

|  |
| --- |
| * **For CMR+IMR (dedicated IMR configured), how to calculate L1-SINR:**
* the numerator is the signal power measured on CMR and the denominator (interference and noise) is the total received power on associated IMR.
 |

* For CMR only scenario, the methodology to calculate the denominator would be different from the CMR+IMR, because the denominator cannot be total power and it would depend on the signal part estimation. As a result, it would be less accurate, because both of denominator and numerator parts need to consider estimation errors.

Issue 3-1-3:We agree with option 1 and the reason is same as Issue 3-1-1.Issue 3-1-4:We propose option 3.At least for FR2, we suggest 3 dB higher than for normal condition. Because L1-SINR could be regard as two L1-RSRP difference in dB domain and it is similar to L1-RSRP relative requirement, thus we can take the L1-RSRP relative accuracy requirement as a reference to define the extreme accuracy. The L1-RSRP accuracy requirement is provided as follows.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| metric | RS | absolute/relative | FR1/FR2 | NormalAccuracy | ExtremeAccuracy | Side condition |
| L1-RSRP | SSB | relative | FR1 | 3 | 4 | -3 |
| FR2 | 6.5 | 9.5 |
| CSI-RS | relative | FR1 | 3 | 4 |
| FR2 | 6.5 | 9.5 |

For FR1, the extreme accuracy is 1 dB higher than for normal condition. However, we need to further check and discuss in next meeting.Issue 3-1-5:Support Option 2, it is related to Issue 3-1-2. |
| Huawei | Issue 3-1-1:Our simulation results are derived by delta-SINR (=the measured SINR minus the ideal SINR) and only consider BB implementation.Issue 3-1-2:The accuracy is mainly determined by the SNR level of CMR.We prefer option 3, but we can compromise to option 2.Issue 3-1-3:We support option 1.There is no need to consider RF margin since SINR is a ratio value. For FR2, it is also assumed that UE perform channel measurement and interference measurement with the same Rx beam.Issue 3-1-5:We prefer option 1, since the side conditions are different for each scenario. |
| Nokia, Nokia Shanghai Bell | **Issue 3-1-1:**Our simulation results are obtained as follows:L1-SINR = (estimated SINR – ideal SINR)The simulation results are raw data. That is, no implementation impairments, etc. were considered. **Issue 3-1-2:**First, the average of raw simulation results from different companies should be determined. Based on the average of the raw simulation results, the grouping can be made. The grouping depends on what the acceptable granularity between the different levels is. Obviously, a large level of granularity would reduce the number of groups.**Issue 3-1-3:**Our simulation results show no significant difference in L1-SINR between FR1 and FR2. However, the proponents of Option 2 should provide further technical details as to what causes RF margin for FR2 to be higher than FR1. Option 1 is preferred. **Issue 3-1-4:**Option 1 seems reasonable following the same methodology as SS-SINR. **Issue 3-1-5:**Either option 1 or option 2 is OK. This might depend on the outcome of Issue 3-1-2.  |
| **Qualcomm** | **Issue 3-1-1:**  Our proposal is based on L1-SINR = (estimated SINR – ideal SINR);We further padded with different implementation margins for FR1 v.s. FR2 respectively.**Issue 3-1-2:** We support option1. But we think we shall align the accuracy case by case by averaging or picking the worst, after which we may group the accuracy only if numbers are the same. Thus we share the similar view as Nokia.**Issue 3-1-3:** We support option2. One specialty in FR2 is due to the different antenna gain depending on the signal and interference may impinge on the main lobe or side lobe of the beam front, while this is not the case for FR1 antennas. Note that same Rx beam doesnot necessarily mean same antenna gain for signals from different AoAs. As an example,Assume both signal and interference experience 0dB antenna gain and equal power of signal, interference and noise. Then, SINR=1/(1+1+1)=0.333;If assuming the interference is picked up by the side lobe with -3dB antenna gain over a different AOA, SINR2=1/(1+0.5+1)=0.4. Thus the SINR can be 0.8dB higher in this case. But **in the OTA test UE doesnot know which is the true value** which leaves the 10log10(0.4/0.333)=0.8dB as the intrinsic uncertainty that affects the accuracy of FR2.**Issue 3-1-4:** FFS.**Issue 3-1-5:** Option1 is supported since we have test cases for each scenario as planned in issue 4-1-1 |

### CRs/TPs comments collection

*Major close-to-finalize WIs and Rel-15 maintenance, comments collections can be arranged for TPs and CRs. For Rel-16 on-going WIs, suggest to focus on open issues discussion on 1st round.*

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| R4-2016240Nokia |  |
|  |
|  |

## Summary on 2nd round (if applicable)

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

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

# Topic #4: Test Case for L1-SINR Measurement

*Main technical topic overview. The structure can be done based on sub-agenda basis.*

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2014604Discussion on test cases for L1-SINR measurement | MediaTek | **Observation 1: In current TS 38.133 specification, the CSI-RS resources set are configured with “repetition=OFF” in all L1-RSRP measurement test case.****Proposal 1: For procedure and performance requirement, to define the NZP CSI-RS based L1-SINR measurement test case as NZP CSI-RS with “repetition=OFF” rather than “repetition=ON”.****Proposal 2: Regarding the L1-SINR measurement procedure, to define the test case with NZP CSI-RS as IMR rather than with CSI-IM as IMR.****Proposal 3: For CMR only scenario, no need to define the test case for the measurement procedure** |
| R4-2015472Discussion on L1-SINR measurement tests for NR eMIMO | Huawei, HiSilicon | **Proposal 1: It is suggested to define 5 L1-RSRP measurement test cases in sections A.4.6, A.4.7, A.5.6, A.5.7, A.6.6, A.6.7, A.7.6 and A.7.7. And the structure of L1-RSRP measurement test cases could be defined as follows: see the table in R4-2015472.****Proposal 2: The L1-RSRP measurement test setups are proposed as Table 2.****Proposal 3: CSI-IM configurations and one type of aperiodic CSI-RS configuration with repetition=off need to be introduced as IMR.** |

## 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 4-1

***Spec structure for L1-SINR measurement procedure test cases***

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

**Issue 4-1-1: Scenarios defined for L1-SINR measurement procedure test cases in the spec**

* Proposals
	+ Option 1: All scenarios are defined follow the same methodology as L1-RSRP, i.e. (5 scenarios x 2 FR x 2 DRX)
	+ Option 2: Simplify the test scenarios defined for the test (Nokia, Qualcomm, Apple)
		- Option 2a: Each scenario (1A, 2A, 2B, 2C, 2D) corresponding to either DRX and non-DRX (Huawei)
		- Option 2b: Define the test case with NZP-CSI-RS as IMR for dedicated IMR scenario and not to define the tests with CSI-IM as IMR.
		- Option 2c: For dedicated IMR scenario, only define (non-DRX x CSI-IM IMR) and (DRX x CSI-RS IMR) test case (MediaTek, Samsung)
		- Option 2d: Define test for CSI-RS CMR only in non-DRX, SSB CMR+CSI-IM IMR in non-DRX and CSI-RS CMR+CSI-RS IMR in DRX (Huawei)
* Recommended WF
	+ Companies’ views are collected in 1st round discussion.

**Issue 4-1-2: Whether to define test cases for CMR only scenario**

* Proposals
	+ Option 1: Define test cases for CMR only scenario (Qualcomm, Huawei, Ericsson, Samsung)
		- Option 1a: Discuss on if non-DRX and DRX cases are both needed in the scenario (Samsung)
	+ Option 2: Do not define test cases for CMR only scenario (MediaTek, Apple)
* Recommended WF
	+ Companies’ views are collected in 1st round discussion.

### Sub-topic 4-2

***Settings for L1-SINR measurement procedure test cases***

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

**Issue 4-2-1: Repetition configuration for NZP-CSI-RS based L1-SINR measurement test case**

* Proposals
	+ Option 1: Repetition = off (MediaTek, Qualcomm, Apple, Huawei, Ericsson, Samsung)
* Recommended WF
	+ Support Repetition = off for all cases in sssssL1-SINR measurement test case.

**Issue 4-2-2: IMR configuration for L1-SINR measurement test case**

* Proposals
	+ Option 1: CSI-IM configurations and one type of aperiodic CSI-RS configuration with repetition=off need to be introduced in 38.133 Annex A (MediaTek, Qualcomm, Apple, Huawei, Ericsson)
	+ Option 2: Other solutions
* Recommended WF
	+ Companies’ views are collected in 1st round discussion.

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
| MediaTek | Sub topic 4-1: Issue 4-1-1:We tend to agree with option 2c because it is with the minimum number of test cases, while it select on DRX and on IMR type for each scenario.Issue 4-1-2:We suggest option 2, because, the UE’s behavior of CMR ouly are very similar to L1-RSRP, regarding the measurement procedure test case.Sub topic 4-2:Issue 4-2-1:We suggest option 1. Following the same logic as L1-RSRP test case, for L1-SINR measurement, the procedure (delay) test case may be defined while NZP-CSI-RS is only configured with “repetition=OFF”.Issue 4-2-2We suggest option 1, where CSI-IM could be used for accuracy test. |
| Nokia | Sub topic 4-1: Issue 4-1-1:Option 2 is used to further down select suitable test cases in which L1-RSRP methodology can be used. Issue 4-1-2:This depends on the outcome of Issue 4-1-1.Sub topic 4-2:Issue 4-2-1:There is only one option outlined. Should there be another option? |
| Qualcomm | **Issue 4-1-1: Scenarios defined for L1-SINR measurement procedure test cases in the spec**Option2 in general could be supported for avoiding many test cases.**Issue 4-1-2: Whether to define test cases for CMR only scenario**We support option1, as it reflects one category of scenarios which was discussed to support by RAN4.**Issue 4-2-1: Repetition configuration for NZP-CSI-RS based L1-SINR measurement test case** Recommended WF can be agreed.**Issue 4-2-2: IMR configuration for L1-SINR measurement test case**Recommended WF can be agreed to introduce IMR configuration for RMC. |
| Apple | Sub topic 4-1: Issue 4-1-1: We prefer option 2 to reduce number of testcases. Option 2c significantly reduces testcases.Issue 4-1-2: We support option 2 to reduce testcases. Also, CMR only L1-SINR is similar to L1-RSRP.Sub topic 4-2: Issue 4-2-1: We are fine with the recommended WF.Issue 4-2-2: We are fine with adding config that’s needed for the agreed testcases.  |
| Huawei | Issue 4-1-1: We support option 2a and option 2d* Option 2d: define test for CSI-RS CMR only in non-DRX, SSB CMR+CSI-IM IMR in non-DRX and CSI-RS CMR+CSI-RS IMR in DRX

Issue 4-1-2: Support option 1.Issue 4-2-1: We can agree with the recommended WF.Issue 4-2-2: Depend on the discussion on issue 4-1-1. But IMR configuration is needed. |
| Ericsson | Sub-topic 4-1Issue 4-1-1: Option 2. We are ok to reduce the number of test cases in general, but we need to cover all the scenarios (1A, 2A, 2B, 2C, 2D). We need discuss how to reduce the number of test cases. Issue 4-1-2: Option 1. CMR-only L1-SINR is similar to L1-RSRP, but not the same. Sub-topic 4-2Issue 4-2-1: Support the moderator’s recommended WF.Issue 4-2-2: Support option 1. |
| CMCC | **Issue 4-1-1: Scenarios defined for L1-SINR measurement procedure test cases in the spec**Our preference is option 1, but we also understand companies’ concern on the number of test cases. We can consider option 2 to move forward, but we are not OK to only test partial scenarios, in our view, all 5 scenarios need to be tested, and we are open not to duplicate each scenario just for DRX and non-DRX.**Issue 4-1-2: Whether to define test cases for CMR only scenario**Option 1 |
| Samsung | Sub topic 4-1: Issue 4-1-1: Prefer option 2c to simplify the scenarios for the test.Issue 4-1-2: Prefer option 1, CMR only scenario is still needed. But we could discuss on if non-DRX and DRX cases are both needed in this scenario. Sub topic 4-2: Issue 4-2-1: Support option 1 Repetition = off for all cases in L1-SINR measurement test case.[To Nokia]: No other solution in the submitted contributions, you could add your solution in the summary if any.Issue 4-2-2: It seems no other better solution for defining the test case. CSI-IM configurations and one type of aperiodic CSI-RS configuration with repetition=off need to be introduced in 38.133 Annex A. If any other solution is proposed, we could further discuss.  |
|  |  |

### CRs/TPs comments collection

*Major close-to-finalize WIs and Rel-15 maintenance, comments collections can be arranged for TPs and CRs. For Rel-16 on-going WIs, suggest to focus on open issues discussion on 1st round.*

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| R4-2014291Qualcomm  | Company A |
| Company B |
|  |
| R4-2014757Samsung | Company A |
| Company B |
|  |
| R4-2015473Huawei, HiSilicon |  |
|  |  |

## 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#4-1** | **Issue 4-1-1: Scenarios defined for L1-SINR measurement procedure test cases in the spec*** Proposals
	+ Option 1: All scenarios are defined follow the same methodology as L1-RSRP, i.e. (5 scenarios x 2 FR x 2 DRX)
	+ Option 2: Simplify the test scenarios defined for the test (Nokia, Qualcomm, Apple)
		- Option 2a: Each scenario (1A, 2A, 2B, 2C, 2D) corresponding to either DRX and non-DRX (Huawei)
		- Option 2b: Define the test case with NZP-CSI-RS as IMR for dedicated IMR scenario and not to define the tests with CSI-IM as IMR.
		- Option 2c: For dedicated IMR scenario, only define (non-DRX x CSI-IM IMR) and (DRX x CSI-RS IMR) test case (MediaTek, Samsung)
		- Option 2d: Define test for CSI-RS CMR only in non-DRX, SSB CMR+CSI-IM IMR in non-DRX and CSI-RS CMR+CSI-RS IMR in DRX (Huawei)

*Moderator’s options: Go option 2 to decrease the number of scenarios. Based on companies’ comments, we could propose an option and discuss on GTW.**Tentative agreements:* Discuss on if companies can reach a consensus on the following table: Scenarios defined for L1-SINR measurement procedure:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Mode** | **Scenario** | **CMR** | **IMR** | **DRX** |
| (ED-DC + FR1)and(SA + FR2) | 1A | CSI-RS | N/A | non-DRX |
| 2A | SSB | CSI-IM | DRX |
| 2D | CSI-RS | CSI-RS | DRX |
| (ED-DC + FR2)and(SA + FR1) | 1A | CSI-RS | N/A | DRX |
| 2C | SSB | CSI-RS | non-DRX |
| 2B | CSI-RS | CSI-IM | non-DRX |

*Recommendations for 2nd round: Depends on companies’ view.***Issue 4-1-2: Whether to define test cases for CMR only scenario*** Proposals
	+ Option 1: Define test cases for CMR only scenario (Qualcomm, Huawei, Ericsson, Samsung)
		- Option 1a: Discuss on if non-DRX and DRX cases are both needed in the scenario (Samsung)
	+ Option 2: Do not define test cases for CMR only scenario (MediaTek, Apple)

*Moderator’s opinion: Can be merged into issue 4-1-1**Tentative agreements: Discuss issue 4-1-1 in GTW session.**Recommendations for 2nd round: Depends on companies’ view.* |
| **Sub-topic#4-2** | **Issue 4-2-1: Repetition configuration for NZP-CSI-RS based L1-SINR measurement test case** * Proposals
	+ Option 1: Repetition = off (MediaTek, Qualcomm, Apple, Huawei, Ericsson, Samsung)

*Moderator’s opinion: Go with option 1**Tentative agreements:* For NZP-CSI-RS based L1-SINR measurement Repetition = off.*Recommendations for 2nd round: N/A***Issue 4-2-2: IMR configuration for L1-SINR measurement test case*** Proposals
	+ Option 1: CSI-IM configurations and one type of aperiodic CSI-RS configuration with repetition=off need to be introduced in 38.133 Annex A (MediaTek, Qualcomm, Apple, Huawei, Ericsson)
	+ Option 2: Other solutions

*Moderator’s opinion: Go with option 1**Tentative agreements:* CSI-IM configurations and one type of aperiodic CSI-RS configuration with repetition=off need to be introduced in 38.133 Annex A*Recommendations for 2nd round: N/A* |

*Recommendations on WF/LS assignment*

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

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation**  |
| R4-2014291Qualcomm  | May need to be revised depending on the issue 4-1-1**Qualcomm**: revised to R4-2017167 |
| R4-2014757Samsung | May need to be revised depending on the issue 4-1-1 |
| R4-2015473Huawei, HiSilicon | May need to be revised depending on the issue 4-1-1 |

## Discussion on 2nd round (if applicable)

### Sub-topic 4-1

*Open issues and candidate options before 2nd round:*

**Issue 4-1-1: Scenarios defined for L1-SINR measurement procedure test cases in the spec**

* Proposals
	+ Option 1: Scenarios defined for L1-SINR measurement procedure for simplifying: (Samsung)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Mode** | **Scenario** | **CMR** | **IMR** | **DRX** |
| (ED-DC + FR1)and(SA + FR2) | 1A | CSI-RS | N/A | non-DRX |
| 2A | SSB | CSI-IM | DRX |
| 2D | CSI-RS | CSI-RS | DRX |
| (ED-DC + FR2)and(SA + FR1) | 1A | CSI-RS | N/A | DRX |
| 2C | SSB | CSI-RS | non-DRX |
| 2B | CSI-RS | CSI-IM | non-DRX |

* + Option 2: Other combinations
* Recommended WF
	+ Companies’ views are collected in 2nd round discussion. Option 2 support should list their table in the comment.

## Companies views’ collection for 2nd round

### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Samsung | **Issue 4-1-1:** We support option 1 to reduce the cases for the L1-SINR measurement procedure test.  |
| MediaTek | Issue 4-1-1:Our views are provided as follows.* For scenario 2A, 2B, 2C and 2D, we are fine with the tentative agreements.
* For scenario 1A, the tests can be further reduced by keeping just 1 row on the table. The reasons are provided below:
* Other scenario on the table has only one row.

The UE behavior of L1-RSRP measurement will be similar as in EN-DC or as in SA. |
| Huawei | Issue 4-1-1: We can agree option 1. |
| Nokia, Nokia Shanghai Bell | **Issue 4-1-1:** Option 1 is OK. |
| **Qualcomm** | Option1 is supported for Issue 4-1-1 |
|  |  |
|  |  |

### CRs/TPs comments collection

*Major close-to-finalize WIs and Rel-15 maintenance, comments collections can be arranged for TPs and CRs. For Rel-16 on-going WIs, suggest to focus on open issues discussion on 1st round.*

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| R4-2014291Qualcomm |  |
| R4-2014757Samsung |  |
| R4-2015473Huawei, HiSilicon |  |
| R4-2014292Qualcomm  |  |
| R4-2015474Huawei, HiSilicon |  |

## Summary on 2nd round (if applicable)

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

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

# Topic #5: Test Case for Scell Beam Failure Recovery

*Main technical topic overview. The structure can be done based on sub-agenda basis.*

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2014605Discussion on test cases for SCell BFR | MediaTek | **Observation 1: Only consider the periodic CSI-RS as BFD-RSs for SCell BFR in test case.****Proposal 1: To configure CSI-RS resources as CBD-RSs in FR2****Proposal 2: To introduce test cases for Beam Failure Detection and Link Recovery with the following cases:****• FR1 SCell configured with CSI-RS based BFD and SSB-based CBD in non-DRX mode****• FR2 SCell configured with CSI-RS based BFD and CSI-RS-based CBD in non-DRX mode****• FR1 SCell configured with CSI-RS based BFD and SSB-based CBD in DRX mode****• FR2 SCell configured with CSI-RS based BFD and CSI-RS-based CBD in DRX mode****Observation 2: The test for “BFD and link recovery procedure” and “Link Recovery with Link Recovery Request (LRR)” are ending up with performing random access procedure and PUCCH transmission, respectively.****Proposal 3: To check the PRACH transmission as the test requirement in test case “BFD and link recovery procedure”** |
| R4-2015828Link recovery test with link recovery requests | Ericsson | **Proposal 1: RAN4 defines two test cases for link recovery in SCell.** **• Scenario 1: Network does not configure PUCCH for SR for BFR MAC CE****• Scenario 2: Network configures PUCCH for SR for BFR MAC CE****Proposal 2: Test setup of two scenarios, e.g., time duration, q0/q1 configuration, are common for both scenarios.****Proposal 3: Scenario 1 does not configure PUCCH as same as the existing BFR tests on PCell/PSCell, although Scenario 2 configures PUCCH for SR for BFR MAC CE. It verifies UE transmits RACH for SR, followed by BFR MAC CE containing a beam associated with the candidate beam set q1.****Proposal 4: Scenario 2 verifies UE transmits PUCCH with an LRR, followed by BFR MAC CE containing a beam associated with the candidate beam set q1.** |

## 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 5-1

***Spec structure for Scell Beam Failure Recovery test cases***

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

**Issue 5-1-1: Scenarios defined for Beam Failure Recovery tests cases**

* Proposals
	+ Option 1: (MediaTek, Ericsson, Samsung)
		- Scenario 1: Network does not configure PUCCH for SR for BFR MAC CE
		- Scenario 2: Network configures PUCCH for SR for BFR MAC CE
	+ Option 2: Scenario 1 is not needed. (Qualcomm, Apple)
* Recommended WF
	+ Companies’ views are collected in 1st round discussion. Also the subsection titles for the test should be defined.

**Issue 5-1-2: The setting of cases to be defined for each scenario**

* Proposals
	+ Option 1: Define setting combination for each scenario as table below (MediaTek, Ericsson, Samsung)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Mode** | **BFD-RSs** | **DRX** | **FR** | **CBD-RSs** |
| ED-DC / Standalone (SA) | CSI-RS | non-DRX | FR1 | SSB |
| FR2 | CSI-RS |
| DRX(40 ms for FR1 and640 ms for FR2) | FR1 | SSB |
| FR2 | CSI-RS |

* + Option 2: Other combinations
* Recommended WF
	+ Companies’ views are collected in 1st round discussion. Maintain the necessary cases and try to reduce the total number.

### Sub-topic 5-2

***Defining Scell Beam Failure Recovery test cases***

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

**Issue 5-2-1: Configuration for Beam Failure Recovery test cases**

* Proposals
	+ Option 1: Reuse the same test parameters for both scenarios with the same setting (MediaTek Ericsson,)
	+ Option 2: Other solutions
* Recommended WF
	+ Companies’ views are collected in 1st round discussion.

**Issue 5-2-2: UE behaviour of BFR for the scenario dedicated PUCCH is not configured**

* Proposals
	+ Option 1: UE shall transmit preamble on a beam associated with the candidate beam set q1. (MediaTek, Ericsson)
	+ Option 2: UE shall transmit preamble on a beam followed by BFR MAC CE containing a beam associated with the candidate beam set q1. (Samsung)
* Recommended WF
	+ Companies’ views are collected in 1st round discussion. This is a somewhat new requirement, UE behaviour should be clarify in the test.

**Issue 5-2-3: UE behaviour of BFR for the scenario dedicated PUCCH is configured**

* Proposals
	+ Option 1: UE shall transmit PUCCH with LRR, followed by BFR MAC CE containing a beam associated with the candidate beam set q1. (Ericsson, Samsung, Apple)
	+ Option 2: Test case only include PUCCH transmission (MediaTek, Qualcomm, )
* Recommended WF
	+ Companies’ views are collected in 1st round discussion. This is a somewhat new requirement, UE behaviour should be clarify in the test. Companies may need to discuss on if the test only include PUCCH transmission or include MAC CE transmission as well.

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
| MediaTek | Sub topic 5-1: Issue 5-1-1:We agree with option 1. In our understanding, the last procedure in SCell BFR test case will depend on whether *schedulingRequestID-BFR-SCell-r16* is configured, i.e. PUCCH for SR for BFR MAC CE is configured or not. * Scenario 1: Network does not configure PUCCH for SR for BFR MAC CE

According to clause 5.4.4 in TS 38.321 as follows, the random access procedure will be triggered while there is no PUCCH resource, i.e., UE is not provided by *schedulingRequestID-BFR-SCell-r16*.

|  |
| --- |
| As long as at least one SR is pending, the MAC entity shall for each pending SR:1>if the MAC entity has no valid PUCCH resource configured for the pending SR:2>initiate a Random Access procedure (see clause 5.1) on the SpCell and cancel the pending SR. |

* Scenario 2: Network configures PUCCH for SR for BFR MAC CE

According to TS38.213 as follows, the PUCCH transmission will be triggered while UE has PUCCH resource, i.e., UE is provided by *schedulingRequestID-BFR-SCell-r16*.

|  |
| --- |
| A UE can be provided, by *schedulingRequestID-BFR-SCell-r16*, a configuration for PUCCH transmission with a link recovery request (LRR) as described in Clause 9.2.4. The UE can transmit in a first PUSCH MAC CE providing index(es) for at least corresponding SCell(s) with radio link quality worse than Qout,LR, indication(s) of presence ofqnew for corresponding SCell(s), and index(es)qnew for a periodic CSI-RS configuration or for a SS/PBCH block provided by higher layers, as described in [11, TS 38.321], if any, for corresponding SCell(s). |

Issue 5-1-2:We suggest option 1. In order to reduce the testing time, the CSI-RS based CBD-RSs are configured in FR2 because the periodicity of CSI-RS resource is short than SSB.Sub topic 5-2:Issue 5-2-1:We suggest option 1 to reuse the same parameter, e.g. the setting of BFD-RSs or CBD-RSs, for both scenario because the difference between these two scenarios is the last procedure in test case only.Issue 5-2-2:We agree with option 1 and disagree with option 2 because following the same logic as the existing RLM test case, the test case for scenario 1 shall be ended up with random access procedure. Issue 5-2-3:We disagree with option 1. RAN4 only has agreed that to specify requirements of “step 1 of BFRQ” for the PUCCH transmission, but it was not agreed to introduce the requirement of “step 2 of BFRQ” for PUSCH transmission. Thus, we think PUSCH transmission procedure should not be included in this test.Agreement:

|  |
| --- |
| Necessity of Requirement of Step-1 of BFRQ on SCellRAN4 should define the requirement of PUCCH-based link recovery request (LLR), in which UE reports beam failure event through a dedicated SR like PUCCH resources. |

 |
| Qualcomm | **Issue 5-1-1: Scenarios defined for Beam Failure Recovery test cases**Since the core requirement does not specify scenario1, we can focus on defining test case for scenario2.**Issue 5-1-2: The setting of cases to be defined for each scenario**Recommended WF is agreeable.**Issue 5-2-1: Configuration for Beam Failure Recovery test cases**This depends on the agreement in issue 5-1-1 because we may not need to test the scenario 1.**Issue 5-2-2: UE behaviour of BFR for the scenario dedicated PUCCH is not configured**This depends on the agreement in issue 5-1-1 because we may not need to test the scenario 1.**Issue 5-2-3: UE behaviour of BFR for the scenario dedicated PUCCH is configured**Option2 is supported in line with RAN4 agreement as MTK suggested. |
| Ericsson | Sub-topic 5-1Issue 5-1-1: Support Option 1Issue 5-1-2: Support Option 1Sub-topic 5-2Issue 5-2-1: Support Option 1Issue 5-2-2: Support Option 1For the case the dedicated PUCCH for SR for BFR is not configured, it is not specified in TS38.133 8.5. This is the reason we support option 1. We are also fine with option 2 if other companies agree to verify. Issue 5-2-3: Support Option 1. We think Rel-15 BFR tests verify UE reports the found beam index by checking the used PRACH preamble associated to q1. For BFR on Scell, it is also important to verify UE reports the found beam index in MAC CE. |
| Apple | Issue 5-1-1: Option 1/ Scenario 2 The core requirement is defined for Scenario 2, hence test case should be for that. It is unclear why Scenario 1 is discussed. Same view as QC.Issue 5-1-2: We are fine with recommended WF.Issue 5-2-1/2: We prefer to define test only for scenario 2. Depends on Issue 5-1-1Issue 5-2-3: Option 1. We have core requirement for transmission of PUCCH. But BFR MAC-CE with candidate beam can also be tested. |
| Samsung | Sub topic 5-1: Issue 5-1-1: Prefer option 1. Depends on the discussion on issue 5-2-2.[To Qualcomm]: We think both situations are needed as Scell BFR is new test case and not defined before.Issue 5-1-2: Option 1 is OK. Sub topic 5-2: Issue 5-2-2: Let us clarify the whole procedure:For Scell BFR triggered, UE will send a SR for request enough UL-SCH resources which are used for UE to transmit BFR MAC CE. (38.321 5.17) And if no dedicated PUCCH resource for the SR is configured, a Random Access procedure is initated. (38.321 5.4.4)Then the problem is, whether the candidate beam is indicated by the following MAC CE, or is indicated implictly by the random access procedure like BFR for SPcell in Rel-15.In Rel-15, for SPcell BFR, UE will initiate a random access procedure for BFR. But the situation is changed in Rel-16:* For SPcell CFRA, BFR is achieved by RA, the same procedure as Rel-15.
* For SPcell CBRA, UE transmits RACH first for applying UL-SCH resources and then MAC CE on the UL resource for BFR. This procedure has been changed since Rel-16.
* For Scell BFR, LRR is transmitted on PUSCH first for UL resource application, then followed by MAC CE containing candidate beams.
* For Scell BFR without dedicated resource for BFR SR on PUCCH, UE will transmit RACH first for UL resource application, then followed by MAC CE on the UL-SCH containing candidate beams.

Based on the above procedure, UE behaviour in the test case should be Option 2.Issue 5-2-3: In this case the procedure is clear, UE send LRR first and then candidate beams via BFR MAC CE on UL-SCH. Support option 1. (38.213 section 6)But in RAN4 test case, if the test only include PUCCH transmission or include MAC CE transmission as well, may need further discussion. In our view, MAC CE contains the candidate beams so that it is also a part of BFR procedure. Thus it should not be precluded.  |

### CRs/TPs comments collection

*Major close-to-finalize WIs and Rel-15 maintenance, comments collections can be arranged for TPs and CRs. For Rel-16 on-going WIs, suggest to focus on open issues discussion on 1st round.*

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| R4-2014606MediaTek | Company A |
| Company B |
|  |
| R4-2015829Ericsson | Company A |
| Company B |
|  |
|  |  |
|  |  |

## Summary for 1st round

### Open issues

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

|  |  |
| --- | --- |
|  | **Status summary**  |
| **Sub-topic#5-1** | **Issue 5-1-1: Scenarios defined for Beam Failure Recovery tests cases*** Proposals
	+ Option 1: (MediaTek, Ericsson, Samsung)
		- Scenario 1: Network does not configure PUCCH for SR for BFR MAC CE
		- Scenario 2: Network configures PUCCH for SR for BFR MAC CE
	+ Option 2: Scenario 1 is not needed. (Qualcomm, Apple)

*Moderator’s opinion: Scell BFR test case is needed. And for the test two scenarios exist, corresponding to different UE behaviors. If we do not define the test for Scenario 1, no test case could guarantee correct UE behavior during SCell BFR procedure in Scenario 1 which is possible and important for UE. Discuss the issue in GTW session.**Tentative agreements: Discussion on whether Scenario 1 is needed.**Recommendations for 2nd round: Depends on companies’ view.***Issue 5-1-2: The setting of cases to be defined for each scenario*** Proposals
	+ Option 1: Define setting combination for each scenario as table below (MediaTek, Ericsson, Samsung)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Mode** | **BFD-RSs** | **DRX** | **FR** | **CBD-RSs** |
| ED-DC / Standalone (SA) | CSI-RS | non-DRX | FR1 | SSB |
| FR2 | CSI-RS |
| DRX(40 ms for FR1 and640 ms for FR2) | FR1 | SSB |
| FR2 | CSI-RS |

* + Option 2: Other combinations

*Moderator’s opinion: Option 1.**Tentative agreements:* Define setting combination for each scenario as table below

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Mode** | **BFD-RSs** | **DRX** | **FR** | **CBD-RSs** |
| ED-DC / Standalone (SA) | CSI-RS | non-DRX | FR1 | SSB |
| FR2 | CSI-RS |
| DRX(40 ms for FR1 and640 ms for FR2) | FR1 | SSB |
| FR2 | CSI-RS |

*Recommendations for 2nd round: N/A* |
| **Sub-topic#5-1** | **Issue 5-2-1: Configuration for Beam Failure Recovery test cases*** Proposals
	+ Option 1: Reuse the same test parameters for both scenarios with the same setting (MediaTek Ericsson,)
	+ Option 2: Other solutions

*Moderator’s opinion: Option 1.**Tentative agreements:* Reuse the same test parameters in both scenarios (PUCCH for SR and no PUCCH for SR) for Scell BFR test cases*Recommendations for 2nd round: N/A.***Issue 5-2-2: UE behaviour of BFR for the scenario dedicated PUCCH is not configured*** Proposals
	+ Option 1: UE shall transmit preamble on a beam associated with the candidate beam set q1. (MediaTek, Ericsson)
	+ Option 2: UE shall transmit preamble on a beam followed by BFR MAC CE containing a beam associated with the candidate beam set q1. (Samsung, Ericsson)

*Moderator’s opinion: For Rel-16, UE behavior for Scell BFR** For Scell BFR, LRR is transmitted on PUSCH first for UL resource application, then followed by MAC CE containing candidate beams. (PUCCH configured for SR)
* For Scell BFR without dedicated resource for BFR SR on PUCCH, UE will transmit RACH first for UL resource application, then followed by MAC CE on the UL-SCH containing candidate beams. (no PUCCH for SR)

*UE behavior should be Option 2. Discuss the issue in GTW session.**Tentative agreements: Discussion on UE behavior in two scenarios.**Recommendations for 2nd round: Depends on companies’ view.***Issue 5-2-3: UE behaviour of BFR for the scenario dedicated PUCCH is configured*** Proposals
	+ Option 1: UE shall transmit PUCCH with LRR, followed by BFR MAC CE containing a beam associated with the candidate beam set q1. (Ericsson, Samsung, Apple)
	+ Option 2: Test case only include PUCCH transmission (MediaTek, Qualcomm, )

*Moderator’s opinion: Option 1. BFR MAC CE should be included since it contains candidate beams*. *Discuss the issue in GTW session.**Tentative agreements: Discussion on if only include* *PUCCH transmission in the test case.**Recommendations for 2nd round: Depends on companies’ view.* |

*Recommendations on WF/LS assignment*

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

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation**  |
| R4-2014606MediaTek | *Based on 1st round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”*May need to be revised depending on the issue 5-2-2 |
| R4-2015829Ericsson | May need to be revised depending on the discussion |

## Discussion on 2nd round (if applicable)

### Sub-topic 5-1

*Open issues and candidate options before 2nd round:*

**Issue 5-1-1: Scenarios defined for Beam Failure Recovery tests cases**

* Proposals
	+ Option 1: (Samsung, Ericsson)
		- Scenario 1: Network does not configure PUCCH for SR for BFR MAC CE
		- Scenario 2: Network configures PUCCH for SR for BFR MAC CE
	+ Option 2: Scenario 1 is not needed. (Apple)
* Recommended WF
	+ Companies’ views are collected in 2nd round discussion.

**Issue 5-1-2: UE behaviour of BFR for the scenario dedicated PUCCH is not configured**

* Proposals
	+ Option 1: UE shall transmit preamble on a beam associated with the candidate beam set q1.
	+ Option 2: UE shall transmit preamble on a beam followed by BFR MAC CE containing a beam associated with the candidate beam set q1. (Samsung, Ericsson)
* Recommended WF
	+ Companies’ views are collected in 2nd round discussion. Please refer to 1st round companies’ comments.

**Issue 5-1-3: UE behaviour of BFR for the scenario dedicated PUCCH is configured**

* Proposals
	+ Option 1: UE shall transmit PUCCH with LRR, followed by BFR MAC CE containing a beam associated with the candidate beam set q1. (Samsung, Apple, Ericsson)
	+ Option 2: Test case only include PUCCH transmission
* Recommended WF
	+ Companies’ views are collected in 2nd round discussion.

## Companies views’ collection for 2nd round

### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Samsung | **Issue 5-1-1:** Scell BFR test case is needed. And for the test two scenarios exist, each of which is corresponding to different UE behaviors. If we do not define the test for Scenario 1, no test case could guarantee correct UE behavior during SCell BFR procedure in Scenario 1 which is possible and important for UE in practice.**Issue 5-1-2:** As we further checked in RAN2 spec 38.321, we clarify the UE behaviour for Scell BFR procedure in the two cases:* For Scell BFR, LRR is transmitted on PUSCH first for UL resource application, then followed by MAC CE containing candidate beams. (PUCCH configured for SR)
* For Scell BFR without dedicated resource for BFR SR on PUCCH, UE will transmit RACH first for UL-SCH resource application, then followed by MAC CE on the assigned resources containing candidate beams. (no PUCCH for SR)

Therefore, Option 2 is supported as it is the real procedure UE experience.**Issue 5-1-3:** Option 1. BFR MAC CE should be included since it contains candidate beams. The BFR procedure should include the candidate beams reporting for a complete procedure. |
| Apple | **Issue 5-1-1: Scenarios defined for Beam Failure Recovery tests cases**Option 2: We should define testcase for the scenario we have core requirement in our opinion.**Issue 5-1-3: UE behaviour of BFR for the scenario dedicated PUCCH is configured**Option 1: We are fine with defining test to include verification of BFR MAC CE containing candidate beam.  |
|  | **Issue 5-1-1**Option 1.We are interested in the scenario NW does not configure PUCCH for SR for BFR MAC CE because it is up to NW whether the dedicated PUCCH is configured or not. We could reduce the number of test cases if companies’ concern the number of test cases. This is one example:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Mode** | **BFD-RSs** | **DRX** | **FR** | **CBD-RSs** | **PUCCH for SR for BFR** |
| EN-DC | CSI-RS | non-DRX | FR1 | SSB | Configured |
| FR2 | CSI-RS | Configured |
| DRX(40 ms for FR1 and640 ms for FR2) | FR1 | SSB | Not configured |
| FR2 | CSI-RS | Not configured |
| Standalone (SA) | CSI-RS | non-DRX | FR1 | SSB | Not configured |
| FR2 | CSI-RS | Not configured |
| DRX(40 ms for FR1 and640 ms for FR2) | FR1 | SSB | Configured |
| FR2 | CSI-RS | Configured |

**Issue 5-1-2**Option 2. It is important to verify UE report the collect beam index. If UE send indication but report the wrong index, the test is meaningless. We think the reporting is also captured in the RRM core spec. **Issue 5-1-3**Option 1. Same as Issue 5-1-2.  |
| MediaTek | Issue 5-1-1:We suggest option 1. For R16 SCell BFR, **only CBRA is allowed** to recover the link, while network does not configure PUCCH for SR for BFR MAC CE, i.e., UE is not provided by *schedulingRequestID-BFR-SCell-r16*. However, for R15 SpCell BFR, both of CBRA and CFRA are allowed to recover the link. Thus, it is the most different from the existing SpCell BFR test case. Issue 5-1-2:We agree option 2 on the UE behavior for SCell BFR, i.e., UE will perform 4-step RA. Also fine to verify option 2 during the test. |
| **Qualcomm** | **Issue 5-1-1: Scenarios defined for Beam Failure Recovery tests cases**Option 2 is supported.We should **ONLY** define testcase for the scenario we have core requirement.**Issue 5-1-3: UE behaviour of BFR for the scenario dedicated PUCCH is configured**Option 2 is supported. In 8.5.9.2, the requirement is meant for checking the latency only for indicating LRR i.e. “UE shall be capable of transmit PUCCH with a LRR within a period of T” |
|  |  |
|  |  |
|  |  |

### 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**  |
| R4-2014606MediaTek |  |
| R4-2017171(Revision of R4-2015829)Ericsson |  |

## Summary on 2nd round (if applicable)

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

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

# Topic #6: Test Case for Pathloss RS Activation Delay

*Main technical topic overview. The structure can be done based on sub-agenda basis.*

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2014010Test cases for applicable timing for PL RS activated by MAC-CE | ZTE  | **Proposal 1: Test cases for MAC-CE based pathloss RS activation delay shall be defined in TS 38.133.****Proposal 2: Endorse draft CR [4]. (R4-2014011)****Proposal 3: Define test cases for both FR1 and FR2.** |
|  |  |  |

## 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 6-1

***Defining Pathloss RS Activation Delay Test Case***

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

**Issue 6-1-1: Whether to define the test case for MAC-CE based pathloss RS activation delay**

* Proposals
	+ Option 1: Define the test case (ZTE)
		- Option1a: Testability could be discussed first. (Qualcomm, Ericsson, Samsung)
	+ Option 2: Do not define the test case
* Recommended WF
	+ Companies’ views are collected in 1st round discussion.

**Issue 6-1-2: How to define the test case for MAC-CE based pathloss RS activation delay**

* Proposals:
	+ Option 1: Reflect the RS change by the power headroom report (PHR) from the UE (ZTE)
	+ Option 2: Other test methods
* Recommended WF
	+ Companies’ views are collected in 1st round discussion. RAN4 could discuss on testability and test method first. Companies may need more time to study on whether PHR can be used for the test case. Companies are encouraged to contribute to this issue and proponents are supposed to provide more feasible and detailed method.

## Companies views’ collection for 1st round

### Open issues

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| **Company** | **Comments** |
| ZTE | Issue 6-1-1: Option 1. We have the core requirements defined and we need test cases in correspondance. In our view whether we need test cases or not is not a question, we can discuss Issue 6-1-2 directly on how to define such tests.Issue 6-1-2: Option 1. We have prepared a draft CR to show how to do this through triggering a PHR and we consider this as a simple and straightforward way. |
| MediaTek | Sub topic 6-1: More discussion is needed. In ZTE’s TDoc, two methods are provided to discuss the feasibility of PL-RS test case. * Method 1:let the test equipment (TE) monitor the transmission power of the UE before and after the delay defined in core part
* Method 2: UE transmit the power headroom report (PHR) to reflect the change of uplink power.

For method 1, we are not clear the uncertainty on TE receive power measurement, i.e., UE uplink power. Thus, RAN4 need to further study on this method if we agree to define the test case based on method 1.For method 2, it may be a feasible method for PL-RS test case but we would like to hear other companies view. Issue 6-1-2:Wait for the conclusion of Issue 6-1-1. |
| Qualcomm | **Issue 6-1-1: Whether to define the test case for MAC-CE based pathloss RS activation delay**It is worth further discussing whether PHR based approach can be employed. **Issue 6-1-2: How to define the test case for MAC-CE based pathloss RS activation delay**For method2, in R4-2014011, 1. “The UE shall track SSB #1”, does it mean the TCI state has switched from SSB#0 to SSB#1? Or it just means UE detects and measures the SSB#1 with better RSRP? If the latter, we suggest TE to transmit a MAC CE based TCI switch (SSB0🡪SSB1) together with the MAC-CE activation of PL RS for coherence.
2. SSB#0 and SSB#1 shall have larger power difference due to FR1/FR2 relative accuracy
 |
| Apple | Sub topic 6-1: Issue 6-1-1: Option 2 – do not define test case for MAC CE based pathloss RX activation delay. This was agreement in previous meetings. We need more time to understand the suggested PHR based method. **Update**[To ZTE] To clarify earlier comments. After I checked that agreement was not to define requirements if testability was an issue, I meant to delete the first comment that we had previous agreement not to define testcase for this. We need some time to understand the proposed method and would suggest defining test case as FFS for now. |
| Huawei | Issue 6-1-1:Support option 1.The uplink transmission power is determined by several factors, as defined:The pathloss-RS activation only will impact the downlink pathloss estimation . How to set the other parameters to implement different power headroom report for two pathloss-RS will be very complicated. Besides, the RSRP measurement inaccuracy on pathloss-RS shall also be considered. Method 2 seems not quite feasible for testing. |
| ZTE | Issue 6-1-1:A question to Apple: I didn’t find any agreement from the last meeting saying that we wouldn’t define test cases, did I miss anything?Our suggestion is to agree that we need such test cases, and then study the details of the proposed PHR approach. |
| Ericsson | Issue 6-1-1:It depends on the testability. If it is testable, it is good to test the requirements. Need to wait for the conclusion of Issue 6-2-2.Issue 6-1-2:We need more time to check the feasibility of the suggested PHR based method.  |
| Samsung  | Issue 6-1-1: We think we could discuss on the Issue 6-1-2 testability first and then decide whether to define the requirement. Given RAN4 has already defined the core requirement, so we would better strive to find a feasible test method for this requirement first. Issue 6-1-2: As we checked ZTE paper, we do agree PHR is a plausible way to test the core requirement. However, currently the procedure in the discussion paper and dCR seems not to be a feasible way to test the requirement. More detailed procedure and configuration is needed for a feasible test case.If PHR is used for check the PL RS switching, several conditions should be meet. As PHR can reflect the measured PL changes if it is over a predefined threshold, when RS switches it should be guaranteed that the PL measured by the two RSs are different. Therefore in the test case, the detailed setting to make sure the PL one these two RS would be different, at least for the time after switching. But current dCR cannot secure this point. From our understanding, maybe some ways to achieve this. One way is to change the transmit RS sequence in the BS after switching, in order to decrease the measured power in one RS. This may be done by changing the *scramblingID* of the CSI-RS or other parameters. Another way is to transmit these two RSs through different beam in FR2, leading different PL for different RSs. But for either case, it needs more details.To conclude, it is need more time to study on whether PHR can be used for the test case. Companies are encouraged to contribute to this issue and proponents are supposed to provide more feasible and detailed method. |

### CRs/TPs comments collection

*Major close-to-finalize WIs and Rel-15 maintenance, comments collections can be arranged for TPs and CRs. For Rel-16 on-going WIs, suggest to focus on open issues discussion on 1st round.*

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| --- | --- |
| **CR/TP number** | **Comments collection** |
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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#6-1** | **Issue 6-1-1: Whether to define the test case for MAC-CE based pathloss RS activation delay** * Proposals
	+ Option 1: Define the test case (ZTE)
		- Option1a: Testability could be discussed first. (Qualcomm, Ericsson, Samsung)

*Moderator’s opinion: Discuss on the Issue 6-1-2 testability first. Given RAN4 has already defined the core requirement, we would better strive to find a feasible test method for this requirement.**Tentative agreements: Option 1a. Continue discussion in 2nd round.* *Recommendations for 2nd round: Continue discussion in 2nd round. Testability could be discussed first.***Issue 6-1-2: How to define the test case for MAC-CE based pathloss RS activation delay*** Proposals:
	+ Option 1: Reflect the RS change by the power headroom report (PHR) from the UE (ZTE)
	+ Option 2: Other test methods

*Moderator’s opinion: Companies may need more time to study on whether PHR can be used for the test case. Companies are encouraged to contribute to this issue and proponents are supposed to provide more feasible and detailed method.**Tentative agreements: Continue discussion in 2nd round.* *Recommendations for 2nd round: Continue discussion in 2nd round. Companies need more time.* |

*Recommendations on WF/LS assignment*

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

### CRs/TPs

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

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

## Discussion on 2nd round (if applicable)

### Sub-topic 6-1

*Open issues and candidate options before 2nd round:*

**Issue 6-1-1: Testability and test method for MAC-CE based pathloss RS activation delay**

* Proposals:
	+ Option 1: Reflect the RS change by the power headroom report (PHR) from the UE
	+ Option 2: Other test methods
* Recommended WF
	+ Companies’ views are collected in 2nd round discussion. RAN4 could discuss on testability and test method first. Companies are encouraged to contribute to this issue and proponents are supposed to provide more feasible and detailed method.

## Companies views’ collection for 2nd round

### Open issues

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| **Company** | **Comments** |
| Samsung | **Issue 6-1-1:** As the 1st round comments, we do agree PHR is a plausible way to test the core requirement. But currently the procedure in the discussion paper and dCR seems not to be a feasible way to test the requirement. More detailed procedure and configuration are expecting from proponents.Specifically, if PHR is used for check the PL RS switching, several conditions should be meet. As PHR can reflect the measured PL changes if it is over a predefined threshold, when RS switches it should be guaranteed that the PL measured by the two RSs are different. Therefore in the test case, the detailed setting to make sure the PL one these two RS would be different, at least for the time after switching. But current dCR cannot secure this point. Some ways to achieve this can be considered here. One way is to change the transmit RS sequence in the BS after switching, in order to decrease the measured power in one RS. This may be done by changing the *scramblingID* of the CSI-RS or other parameters. Another way is to transmit these two RSs through different beam in FR2, leading different PL for different RSs. But for either case, it needs more details.We expecting more feasible and detailed method is provided. |
| Ericsson | **Issue 6-1-1:**Need more time to check the feasibility of PHR reporting based tests.  |
| ZTE | 6-1-1: Support Option 1. In this meeting we shall agree that such a test is needed and PHR based approach will be used, then during the next meeting we can finalize on the parameters and settings. We suggest to capture in the WF that RAN4 agrees to define test cases based on PHR. |
| MediaTek | Issue 6-1-1:Because it is the first time to discuss the feasibility of the PL-RS test case achieved by PHR. Thus, we may need to check and discuss in next meeting. |
| Huawei | Issue 6-1-1:Need further discussion on the detailed test parameters and check the testability. |
| Nokia, Nokia Shanghai Bell | Issue 6-1-1:Further discuss and check feasibility of the proposed test methodology. |
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### CRs/TPs comments collection

*Major close-to-finalize WIs and Rel-15 maintenance, comments collections can be arranged for TPs and CRs. For Rel-16 on-going WIs, suggest to focus on open issues discussion on 1st round.*

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| R4-2014011ZTE | Company A |
| Company B |
|  |

## 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”* |