**3GPP TSG-RAN WG4 Meeting #94-e R4-20xxxxx**

**Electronic Meeting, Feb.24th – Mar.6th 2020**

**Agenda item:** 6.10.8

**Source:** Moderator (Apple)

**Title:** Email discussion summary for RAN4#94e\_#42\_NR\_NewRAT\_RRM\_Core\_Part\_2

**Document for:** Information

# Introduction

This email discussion summary includes R15 RLM (6.10.8.1), SCell activatin delay requirement (6.10.8.2), PSCell addition/release requirements (6.10.8.3), TCI state switching requirements (6.10.8.4), BWP switching requirements (6.10.8.5), Other requirements (6.10.8.6).

Candidate target of email discussion for 1st round and 2nd round

* 1st round:
	+ Collect comments from companies on the topics/sub-topics and CRs by Wednesday 5pm UTC Feb. 26
	+ Moderators summarize the status and possible proposals, recommending what decisions can be made for 1st round by Thursday 5pm UTC, Feb. 27
* 2nd round:
	+ Companies provide comments for 2nd round and moderators provide second round summary (Monday Mar. 2 – Thursday 5pm UTC Mar. 5).

# Topic #1: RLM (6.10.8.1)

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

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2001584 | Huawei, HiSilicon | Proposed changes:1. For SSB based RLM/BFD/CBD/L1-RSRP, the first condition of Psharingfactor=1 is removed;
2. For SSB based RLM/BFD/CBD/L1-RSRP, the second condition of Psharingfactor=1 is changed. RSSI and deriveSSB-IndexFromCell is considered.
3. Same rules apply to CSI-RS based RLM/BFD/CBD/L1-RSRP.
4. Editorial corrections.
 |
| R4-2001585 | Huawei, HiSilicon | Cat-A CR of R4-2001584 |

## Open issues summary

### Sub-topic 1-1: CR of R4-2001584

Issue 1-1: Is this CR agreeable?

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | Sub topic 1-1: Sub topic 1-2:….Others: |

### 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** |
| R4-2001584 | Apple: we have comment on change #1 (For SSB based RLM/BFD/CBD/L1-RSRP, the first condition of Psharingfactor=1 is removed;) in this CR. The reason is: There is a case that RLM-RS periodicity is 20ms, and SMTC periodicity is 80ms, and MGRP is 80ms, it’s still possible that RLM-RS outside MG is partially overlapped with SMTC.  |
| MTK: Agreed with the CR in principle. But some minor wording changes are needed. For example, UE is not always requested to measure the RSSI, even if *ss-RSSI-Measurement* is configured. Suggest to align the wording with R4-2001789. |
| Qualcomm: Why do we have the word “and” between the following two parts? (i)“~~and~~ fully -overlapped ~~by~~ with intra-frequency SMTC occasions,”ii) ~~are~~ not overlapped ~~by~~ with the SSB symbols indicated by SSB-ToMeasure and 1 data symbol before each consecutive SSB symbols indicated by SSB-ToMeasure and 1 data symbol after each consecutive SSB symbols indicated by SSB-ToMeasure, given that SSB-ToMeasure is configured, and,- not overlapped by the RSSI symbols indicated by ss-RSSI-Measurement and 1 data symbol before each RSSI symbol indicated by ss-RSSI-Measurement and 1 data symbol after each RSSI symbol indicated by ss-RSSI-Measurement, given that ss-RSSI-Measurement is configured, and- deriveSSB-IndexFromCell for the intra-frequency carrier is enabledAssume that (ii) holds but (i) does not hold. That means, the resources are partially overlapped with SMTC occasions but (ii) holds. Won’t the sharing factor be equal to 1 in that scenario? |
| Intel: Don’t need to modify the condition that *deriveSSB-IndexFromCell* for the intra-frequency measurement is enabled for scheduling restriction. Similar as in Scheduling availability during intra-frequency measurements, the condition relies on if SSB-to-be measured is configured or not.  |
| NTT DOCOMO, INC.: We have similar comments as Apple. We are not sure why change#1 is needed. It is possible scenario and UE could perform RLM by using RLM-RS outside measurement gap which is partially overlapped with SMTC. |
|  | Nokia: We would see some further discussion is needed on the wording. Related to the initial change we can somehow understand the reasoning in simplifying the wording. However, then first line is no longer needed, and neither is last line as this parameter is already assumed for intra-f in FR2. Change of Psharing factor would need more discussion. |

## Summary for 1st round

### Open issues

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

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| --- | --- |
|  | **Status summary**  |
| **Sub-topic#1** | *Tentative agreements:**Candidate options:**Recommendations for 2nd round:* |

*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**  |
| R4-2001584 | To be revised |

## Discussion on 2nd round (if applicable)

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| --- | --- |
| **CR/TP number** | **Comments collection** |
| R4-2001584 | Please find feedback to the comments received from companies in the first round. A revision is also uploaded to the folder.**To Apple:**Psharingfactor is only used in three cases. It is already shown in R4-2001584 that the first condition of Psharingfactor = 1 doesn’t satisfy. For your example (RLM-RS period = 20ms，SMTC period = MGRP = 80m), depending on the relative position between SMTC and MG. it shall belong to this case:- $P=\frac{1}{1-\frac{T\_{SSB}}{MRGP} - \frac{T\_{SSB}}{T\_{SMTCperiod}}}$, when the RLM-RS resource is partially overlapped with measurement gap and the RLM-RS resource is partially overlapped with SMTC occasion (TSSB < TSMTCperiod) and SMTC occasion is not overlapped with measurement gap and- TSMTCperiod ≠ MGRP or- TSMTCperiod = MGRP and TSSB < 0.5 × TSMTCperiodor this case:- $P=\frac{1}{1-\frac{T\_{SSB}}{Min(MRGP, T\_{SMTCperiod})}}$, when the RLM-RS resource is partially overlapped with measurement gap and the RLM-RS resource is partially overlapped with SMTC occasion (TSSB < TSMTCperiod) and SMTC occasion is partially or fully overlapped with measurement gapHowever, Psharingfactor is not used in neither one.**To MTK:**According to 38.331. UE is required to perform RSRP **and RSRQ** for serving Cell. Which means RSSI is always needed. **To Qualcomm:**Similar with Apple, If (2) holds but (1) does not, then it is the partial overlapping case. Psharingfactor is not used in this case.**To DOCOMO:**Similar with Apple. **To Intel:**Agree, *deriveSSB-IndexFromCell= true* is redundant, it can be removed.**To DOCOMO:**Similar with Apple. **To Nokia:**The comment “then first line is no longer needed” is not very clear to us. In our view the first line is not needed (pls refer to the feedback to Apple) so it is removed in the change. For the last line, we agree to the comment that *deriveSSB-IndexFromCell= true* is redundant. Nokia: Still discussing RSSI. |

## 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**  |
| R4-2002207 | Agreeable |
| R4-2001585 | Agreeable |

# Topic #2: SCell activation delay requirements (6.10.8.2)

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

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2002077 | Ericsson | Proposal 1: The activation delay requirements for cases of *first unknown SCell in FR2* are to be modified by replacing 24\*Trs with TFirstSSB + 23\*Trs, thereby aligning them with delay requirements for the other SCell activation cases.Proposal 2: The end-points of the interruption windows are to be modified to reflect that the UE is acquiring the first SSB in the target SCell at TFirstSSB or TFirstSSB\_MAX, and not at TSMTC\_MAX, after having received the MAC-CE for SCell activation. |
| R4-2002078 | Ericsson | CR based on discussion paper R4-2002077 |
| R4-2002079 | Ericsson | Cat-A CR of R4-2002078 |
| R4-2002080 | Ericsson | Editorial change on R16 TS38.133. |

## 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: Activation of first unknown SCell in FR2

**Issue 2-1: activation delay requirements for cases of first unknown SCell in FR2**

* Proposals (Ericsson)
	+ The activation delay requirements for cases of *first unknown SCell in FR2* are to be modified by replacing 24\*Trs with TFirstSSB + 23\*Trs, thereby aligning them with delay requirements for the other SCell activation cases
* Recommended WF
	+ TBA

### Sub-topic 2-2: The end-points of the interruption windows for SCell activation

**Issue 2-2: The end-points of the interruption windows for SCell activation**

* Proposals (Ericsson)
	+ The end-points of the interruption windows are to be modified to reflect that the UE is acquiring the first SSB in the target SCell at TFirstSSB or TFirstSSB\_MAX, and not at TSMTC\_MAX, after having received the MAC-CE for SCell activation
* Recommended WF
	+ TBA

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
| MTK | Sub topic 2-1: OK to the changeSub topic 2-2: OK to the change |
| NEC | Issue 2-1: OK with the change. Issue 2-2: OK with the change.  |
| Nokia | Sub topic 2-1: The proposal from Ericsson looks correct.Sub topic 2-2: As for the interrupt length RAN4 should decide the actual length of the interrupt as was done in LTE. The end of the interrupt window would then be clearly defined as the start + interrupt length. Agree with the principle of getting this clarified. In this case ‘first unknown SCell in FR2’ the interrupt length should be rather short – less than 1ms. |

### 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** |
| R4-2002078 | Nokia: Initial change in the CR looks acceptable but we need to discuss and agree on the length of the interrupt to define the end of the interrupt window (the second change in the CR). |
| Company B |
|  |
| R4-2002080 | Nokia: ok |
| 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.*

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|  | **Status summary**  |
| Sub-topic 2-1 | *Tentative agreements:*The activation delay requirements for cases of *first unknown SCell in FR2* are to be modified by replacing 24\*Trs with TFirstSSB + 23\*Trs, thereby aligning them with delay requirements for the other SCell activation cases*Recommendations for 2nd round:*This tentative agreement shall be captured/kept in the CR. |
| Sub-topic 2-2 | *Tentative agreements:*The end-points of the interruption windows are to be modified to reflect that the UE is acquiring the first SSB in the target SCell at TFirstSSB or TFirstSSB\_MAX, and not at TSMTC\_MAX, after having received the MAC-CE for SCell activation*Recommendations for 2nd round:*Nokia has comment on the interruption length and it shall be considered in the revised CR. |

*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 provided recommendation on CRs/TPs Status update suggestion*

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| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation**  |
| R4-2002078 | To be revised |
| R4-2002080 | agreeable |

## Discussion on 2nd round (if applicable)

## Summary on 2nd round (if applicable)

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

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| --- | --- |
| **CR/TP/LS/WF number** | **T-doc Status update recommendation**  |
| R4-2002208 | Withdrawn |
| R4-2002079 | Withdrawn |

# Topic #3: PSCell addition/release requirements (6.10.8.3)

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

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2000055 | ZTE Corporation | The expressions of TFirstSSB and TFirstSSB\_MAX contain error, should be slot n instead of n ms |
| R4-2000056 | ZTE Corporation | Cat-A CR of R4-2000055 but it was uploaded before the e-meeting. |
| R4-2002081 | Ericsson | Proposal 1: The PSCell change delay requirement shall be modified such that it is reflected that no SW re-loading is needed when source and target cells are in the same FR. Following the NR handover requirements, this implies that the requirement shall be based on Tprocessing = 20 ms rather than on Tprocessing = 40 ms. |
| R4-2002082 | Ericsson | CR based on discussion paper R4-2002081. |
| R4-2002083 | Ericsson | Cat-A CR of R4-2002082 |

## 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: Tprocessing revision in PSCell change for EN-DC and NR-DC

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

**Issue 3-1: Tprocessing revision in PSCell change for EN-DC and NR-DC**

* Proposals
	+ The PSCell change delay requirement shall be modified such that it is reflected that no SW re-loading is needed when source and target cells are in the same FR. Following the NR handover requirements, this implies that the requirement shall be based on Tprocessing = 20 ms rather than on Tprocessing = 40 ms.
* Recommended WF
	+ TBA

## Companies views’ collection for 1st round

### Open issues

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| --- | --- |
| **Company** | **Comments** |
| Apple | Sub topic 3-1: we agree PSCell change for NR-DC only need 20ms for Tprocessing. But for EN-DC, if PSCell is changed from FR1 cell to FR2 cell or from FR2 cell to FR1 cell, then Tprocessing time is still 40ms.  |
| MTK | Sub topic 3-1: In the CR R4-2002082, Tprocessing when source and target cells are not in the same FR is missing. |
| NTT DOCOMO, INC. | Sub-topic 3-1: We support the proposal if PSCell change is conducted between the cells in same FR. The case that source and target cells are in different FR can be added. |
| Ericsson | Sub topic 3-1: We agree with the observations by Apple and MediaTek. We can update the proposal (and the CR) to specify 20ms for same and 40ms for different FR for source and target PSCell. |
| NEC | We are OK with the (updated) change |
| Nokia | Sub topic 3-1: Agree that the SW-loading should not be needed as explained in the Tdoc. |

### 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** |
| R4-2000055 | MTK: If the intension is to unify the unit used in SCell activation to ‘slot’, the CR does not resolve this issue because there are still may other paragraph with this unit ambiguity. |
| ZTE: Thank MTK for the comment. The intention is just to correct the error here. |
| Nokia: change is fine for Rel-16. But not essential for Rel-15 |
| R4-2002082 | Apple: same comment as to the discussion paper R4-2002081 |
| MTK: Tprocessing when source and target cells are not in the same FR is missing |
| Ericsson: Thank you Apple and MediaTek. We agree with your observations and can provide a revised CR taking into account both same (20ms) and different (40ms) FR for source and target PSCell. |
|  | Nokia: Agree with the intention of the change. But if all the requirements of 8.9.2 anyway applies it should be enough to refer to 8.9.2 stating that Tprocessing is 20ms and conditions (like the line added). We can discuss the wording. |

## 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 3-1**  | *Tentative agreements:*update the proposal (and the CR) to specify 20ms for same and 40ms for different FR for source and target PSCell*Recommendations for 2nd round:*Revise CR based on the tentative agreement. |

*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 provided recommendation on CRs/TPs Status update suggestion*

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation**  |
| R4-2000055 | To be revised |
| R4-2002082 | 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**  |
| R4-2002209 | Agreeable |
| R4-2000056 | To be revised |
| R4-2002210 | Agreeable |
| R4-2002083 | Agreeable |

# Topic #4: TCI state switching requirements (6.10.8.4)

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

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2000035 | ZTE Corporation | withdrawn |
| R4-2000036 | ZTE Corporation | withdrawn |
| R4-2000514 | ZTE Corporation | Observation 1: Some conditions in the current definition of TCI known state can’t be known by the gNB.Observation 2: The current definition of known TCI state is subject to different interpretations at gNB and UE side.Proposal 1: Further study the impact of mismatch issue based on detailed analysis and simulations |
| R4-2000789 | Apple | There is a mismatch between RAN1 spec and RAN4 spec on this TCI change delay.Proposed change to TS38.133 is:If the target TCI state is known, upon receiving PDSCH carrying MAC-CE activation command at slot n, UE shall be able to receive PDCCH with target TCI state of the serving cell on which TCI state switch occurs at the first slot that is after slot n+ THARQ +(3 ms +TOk\*(Tfirst-SSB + TSSB-proc))/NR slot length. (If TOk =0, then it would be n+THARQ +3ms) |
| R4-2000790 | Apple | Cat-A CR of R4-2000789 |
| R4-2001010 | NEC | Proposal 1: RAN4 to agree on the TCI state mismatch problem. Proposal 2: Acknowledge the problem in the specification through an editor’s note saying “The estimated TCI state at network and actual TCI state at UE may be different in some scenarios. The RRM requirements to solve the different TCI state at gNB and UE may be considered in future releases and may be applied to the present release of specifications”. Proposal 3: Study solution for TCI state mismatch problem in Rel-17 timeframe. |
| R4-2001015 | NEC | CR based on discussion paper R4-2001010 |
| R4-2001026 | MediaTek inc. | 1. Add Repition ON for CSI-RS used if the target TCI state is unknown
2. Delete PUSCH wording in DCI based TCI state switch requirment.
3. Add CSI-RS for reception in scheduling restrcition in RRC based TCI state switch requirement.
4. Delete the PUCCH/PUSCH transmission in scheduling restrcition in RRC based TCI state switch requirement.
5. Delete a space.
 |
| R4-2001334 | Nokia, Nokia Shanghai Bell | Proposal 1: Update UE timing requirement in section 8.10.6 to be aligned with RAN1 requirement.Proposal 2: Update the timing requirement to $n+3N\_{slot}^{subframe,µ}$Proposal 3: Update the current requirement text to reflect the actual delay requirement.We propose following text to section 8.10.6:*If the target TCI state is known, upon receiving PDSCH carrying MAC-CE for TCI States Activation/Deactivation for UE-specific PDSCH update at slot n, UE shall be able to receive PDCCH to schedule PDSCH with the new DCI indicated mapping between TCI states and codepoints of the DCI field 'Transmission Configuration Indication' no later than n + THARQ +* $3N\_{slot}^{subframe,µ}$ *+ TOk\*(Tfirst-SSB + TSSB-proc) / NR slot length. Where THARQ, Tfirst-SSB, TSSB-proc and TOk are defined in clause 8.10.3.* |
| R4-2001668 | Huawei, HiSilicon | Set the time on which UE receive PDCCH with target TCI as a fixed value.i.e., *UE shall be able to receive PDCCH with target TCI state of the serving cell in slot n+ THARQ +(3 ms + TL1-RSRP +TOuk\*(Tfirst-SSB+ TSSB-proc)) / NR slot length.* |
| R4-2001669 | Huawei, HiSilicon | Cat-A CR of R4-2001668 |
| R4-2002052 | Qualcomm Incorporated | Proposal 1: RAN4 to change when the UE switches to the new TCI state. For a command received in slot n, the UE to switch to new TCI state in slot immediately after n+ THARQ +3 ms . UE to meet all performance requirements after n+ THARQ +3 ms +TOk\*(Tfirst-SSB + TSSB-proc). |
| R4-2002066 | Qualcomm Incorporated | Based on the discussion paper R4-2002052 |
| R4-2002067 | Qualcomm Incorporated | Cat-A CR of R4-2002066 |

## 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: Mismatch between RAN1 and RAN4 spec on MAC-CE based TCI switching delay

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

**Issue 4-1: Mismatch between RAN1 and RAN4 spec on MAC-CE based TCI switching delay**

* Proposals
	+ Option1 (Nokia R4-2001334): Update the timing requirement to $n+3N\_{slot}^{subframe,µ}$
	+ Option 2 (Qualcomm R4-2002052): RAN4 to change when the UE switches to the new TCI state. For a command received in slot n, the UE to switch to new TCI state in slot immediately after n+ THARQ +3 ms . UE to meet all performance requirements after n+ THARQ +3 ms +TOk\*(Tfirst-SSB + TSSB-proc).
	+ Option 3: others?
* Recommended WF
	+ TBA

### Sub-topic 4-2: Which slot is the one to apply the new TCI after TCI switching?

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

**Issue 4-2: Which slot is the one to apply the new TCI after TCI switching?**

* Proposals
	+ Option1 (Apple R4-2000789): Change “no later than at slot” to “at the first slot that is after slot”, e.g.,

If the target TCI state is known, upon receiving PDSCH carrying MAC-CE activation command in slot n, UE shall be able to receive PDCCH with target TCI state of the serving cell on which TCI state switch occurs at the first slot that is after slot n+ THARQ +(3 ms +TOk\*(Tfirst-SSB + TSSB-proc)) / *NR slot length*. The UE shall be able to receive PDCCH with the old TCI state until slot n+ THARQ +(3 ms +TOk\*(Tfirst-SSB)) / *NR slot length* +1.

* + Option 2 (Huawei R4-2001668): Set the time on which UE receive PDCCH with target TCI as a fixed value.i.e., *UE shall be able to receive PDCCH with target TCI state of the serving cell in slot n+ THARQ +(3 ms + TL1-RSRP +TOuk\*(Tfirst-SSB+ TSSB-proc)) / NR slot length*
	+ Option 3: others?
* Recommended WF
	+ TBA

### Sub-topic 4-3: Revision on active TCI state list update delay

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

**Issue 4-3: Revision on active TCI state list update delay**

* Proposals
	+ (Nokia R4-2001334): If the target TCI state is known, upon receiving PDSCH carrying MAC-CE for TCI States Activation/Deactivation for UE-specific PDSCH update at slot n, UE shall be able to receive PDCCH to schedule PDSCH with the new DCI indicated mapping between TCI states and codepoints of the DCI field 'Transmission Configuration Indication' no later than n + THARQ + $3N\_{slot}^{subframe,µ}$ + TOk\*(Tfirst-SSB + TSSB-proc) / NR slot length. Where THARQ, Tfirst-SSB, TSSB-proc and TOk are defined in clause 8.10.3.
* Recommended WF
	+ TBA

### Sub-topic 4-4: Problem of TCI state known status mismatch

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

**Issue 4-4: Problem of TCI state known status mismatch**

* Proposals (ZTE R4-2000514, NEC R4-2001010)
	+ Proposal 1: RAN4 to agree on the TCI state mismatch problem.
	+ Proposal 2: Acknowledge the problem in the specification through an editor’s note saying “The estimated TCI state at network and actual TCI state at UE may be different in some scenarios. The RRM requirements to solve the different TCI state at gNB and UE may be considered in future releases and may be applied to the present release of specifications”.
	+ Proposal 3: Study solution for TCI state mismatch problem in Rel-17 timeframe.
* Recommended WF
	+ TBA

## Companies views’ collection for 1st round

### Open issues

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| --- | --- |
| **Company** | **Comments** |
| Apple | Sub topic 4-1: we suggest to keep RAN4 spec unchanged because that’s based on the real condition. We may send LS to RAN1 to ask them to refer to TS38.133, like what they did for SCell activation. |
| MTK | **Issue 4-2: Which slot is the one to apply the new TCI after TCI switching** Support option 1.**Issue 4-3: Revision on active TCI state list update delay** It’s OK.**Issue 4-4: Problem of TCI state known status mismatch**This issue had repeated above half a year. Currently, RAN4 don’t have a common understanding on this. Besides ZTE’s proposal is different. ZTE wants to clarify another issue. Whether SSB is detectable may not be known by network. But actually, this definition is used everywhere in RAN 4 spec, e.g., measurement, handover, SCell activation… and also in LTE spec. We never see this is an issue. |
| QC | Sub-topic 4-1To apple, in Scell activation there is no conflict because the total delay is only capture in RAN4 spec. In TCI state switch, we are ok with the total delay. The key question is what to do after MAC-CE decode and application. We think we should be following RAN1 spec since that agreement was made way before RAN4. Sub-topic 4-2Need resolution of 4-1 firstSub-topic 4-3Fine to changeIssue 4-4We don’t see this as a problem to be studied. There are already existing procedures that can be utilized in case there is a mismatch.  |
| ZTE | Issue 4-4: The mismatch problem should be further investigated, especially to look for possible solutions. |
| Intel | Sub-topic 4-1: Mismatch between RAN1 and RAN4 spec on MAC-CE based TCI switching delayKeep current RAN4 spec unchanged. The reason for introducing the requirements in RAN4 was to address the conditions under which RAN1 timing applies and when additional time is neededSub-topic 4-2: Which slot is the one to apply the new TCI after TCI switchingOption 1. Agree with change “no later than at slot” to “at the first slot that is after slot”, but we can keep receive on the old TCI state until slot n+ THARQ +3 ms+ TL1-RSRP +TOk\*(Tfirst-SSB).Sub-topic 4-3: Revision on active TCI state list update delayOk to change 3ms to $3N\_{slot}^{subframe,µ}$Sub-topic 4-4: Problem of TCI state known status mismatchWe agree that the mismatch exists, just like some other procedure e.g. in Make-Before-Break handover the source cell have no idea when UE will release connection with it. Thus the source cell would keep scheduling the UE during the procedure. Apparently, there is also waste of network resource. However, currently we don’t see any perfect solution that can solve this problem. We are open to do some study in future.--Update 02-27-2020Sub-topic 4-3: The wording should also reflect the agreements in Sub-topic 4-2 – “no later than at slot” to “at the first slot that is after slot”.  |
| NTT DOCOMO, INC. | Sub topic 4-4: We are not sure the benefit of this feature. Basically, if TCI state is changed, UL spatial info would be also changed accordingly. If TCI state status mismatch is happened, which UL beam is applied to indicate such information to NW? NW could know such information via other ways, e.g., HARP processing for PDSCH. |
| Ericsson | **Issue 4-1:** We support making the specifications consistent between RAN4 and RAN1. We have a preference to Qualcomm’s proposal (Option 2). Maybe some further discussion is needed on the anticipated performance loss stemming from that the UE has not had the target TCI state in the list of active TCI states for PDSCH. **Issue 4-2:** Support Option 1**Issue 4-3:** We are OK with the proposal. However, there are multiple definitions of Tfirst-SSB in clause 8.10.3 so this may need to be clarified when/if referencing to 8.10.3. |
| NEC | Issue 4-1: We also have same view as Apple. Issue 4-2: We have concern on changing the wording. If the wording is changed, then UE always takes fixed amount of time, which may have impact on performance. Though target TCI state is not in active TCI state list, some UE may not need extra time and can complete TCI state switch without T\_FirstSSB. If we change the wording, it is always fixed amount of time. Issue 4-3: OK with the change. Issue 4-4: Delays defined in RAN4 are based on worst case scenario. Since there is no feedback from UE that TCI switch is completed, worst case delay defined in RAN4 will eventually become fixed amount of delay for every other scenario also. Which may have impact on overall performance.  |
| Huawei, HiSilicon | Issue 4-1: keep the RAN4 spec unchanged since it embodies the real UE implementation for TCI state switching. On the other hand, it is too late to modify the RAN1’s R15 spec, so no need to send LS to RAN1.Issue 4-2: the intention of option 1 and option 2 is aligned. The difference is the wording.Issue 4-3: the change is agreeable.Issue 4-4: we don’t think this topic needs to be studied, and doubt this is an issue. |
| ZTE | Issue 4-4: We basically agree with Intel. The problem is there, and similar problems exist in other places. We also think RAN4 should explore solutions to it. Do not understand why Huawei doesn’t consider this as an existing issue.We’re not sure if we should prioritize it considering the time frame to complete Rel-16. The proposal of further studying it in Rel-17 from NEC sounds reasonable. |
| Nokia | Sub topic 4-1: More discussion is likely needed to get the requirements correct. We can work further on clarifying the text.Sub topic 4-2: Needs further discussion and also needs to be aligned with sub topics 4-1.Sub topic 4-3: Can be discussed together with other correction under discussion.Sub topic 4-4: This can be discussed in Re-17 time frame. We do not see a need to capture anything in current specification. |

### 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** |
| R4-2000789 | Nokia: Needs further discussion but our view is that current specification is clear. UE shall be able to receive PDCCH no later than when the indicated time has elapsed. |
| Company B |
|  |
| R4-2001015 | ZTE: Not sure if we need to add a statement in the spec (especially no solution is included). We suggest to first finalize on the clear description and possible impact of the problem. Back to the Note itself, we think the first sentence “*The estimated TCI state at network and actual TCI state at UE may be different in some scenarios.*” is pretty neutral, while the following statement “*The RRM requirements to solve the different TCI state at gNB and UE may be considered in future releases and may be applied to the present release of specifications.*” would depend on the scope of future WIs. We suggest to postpone this CR until companies bring proposals on possible solutions. |
| Nokia: Not agreeable. |
|  |
| R4-2001026 | Nokia: Why removing the transmit PUSCH from the requirements? Why Repetition = On? |
| Company B |
|  |
| R4-2001668 | Apple: we have CR on same topic. According to RAN1 spec, UE shall be able to use new TCI on the first slot after the switching delay. We need to keep RAN1 and RAN4 spec consistent. |
| MTK: Do not see the reason why current description prohibits UE from finishing TCI-state switch earlier. |
| Nokia: Seems acceptable but would need to be discussed with the rest of the discussion papers and relevant CR’s. |
| R4-2002066 | Apple: we prefer the old wording in RAN4 spec, and we think RAN1 shall refer to RAN4 spec instead. It can benefit to both NW and UE to stay on the old TCI until UE can actually use the new TCI; otherwise with this change there would be a gap where UE cannot either use old TCI or new TCI. |
| QC: The network can always align the TCI state switch with the SSB, so that both procedures are equivalent. Our preference would be to resolve this issue in RAN4 itself. Huawei: prefer to keep the current RAN4 requirements unchanged. |
| Nokia: Discuss further |

## 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 4-1:** | *Candidate options:*Option 1 is supported by NokiaOption 2 is supported by Qualcomm, EricssonOption 3 (keep RAN4 spec unchanged): Apple, Intel, NEC, Huawei*Recommendations for 2nd round:*Can be further discussed in the revised CR, we can use MTK CR to revise for this topic 4-1, 4-2, 4-3. |
| **Sub-topic 4-2:** | *Candidate options:*Option 1 is supported by Apple, MTK, Intel(with comments on old TCI time), Ericsson, HuaweiOption 2 is supported by HuaweiQualcomm, Nokia commented to hold this issue until we address the issue 4-1. NEC have concern on the wording change.*Recommendations for 2nd round:*Can be further discussed in the revised CR, we can use MTK CR to revise for this topic 4-1, 4-2, 4-3. |
| **Sub-topic 4-3:** | *Tentative agreements:*If the target TCI state is known, upon receiving PDSCH carrying MAC-CE for TCI States Activation/Deactivation for UE-specific PDSCH update at slot n, UE shall be able to receive PDCCH to schedule PDSCH with the new DCI indicated mapping between TCI states and codepoints of the DCI field 'Transmission Configuration Indication' no later than n + THARQ + $3N\_{slot}^{subframe,µ}$ + TOk\*(Tfirst-SSB + TSSB-proc) / NR slot length. Where THARQ, Tfirst-SSB, TSSB-proc and TOk are defined in clause 8.10.3.*Recommendations for 2nd round:*Can be captured in the revised CR by CR leader. We can use MTK CR to revise for this topic 4-1, 4-2, 4-3. |
| **Sub-topic 4-4:** | *Current discussion status:*MTK, Qualcomm, Huawei commented that it’s not an issue.ZTE, NEC is propose to study this issue in the future. Intel is open to study it in the future.Nokia commented that it can be discussed in R17 time frame.*Recommendations for 2nd round:*Continue discussion on CR or come back next meeting. |

*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 provided recommendation on CRs/TPs Status update suggestion*

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| **CR/TP number** | **CRs/TPs Status update recommendation**  |
| R4-2000789 | Noted |
| R4-2001015 | Return to |
| R4-2001026 | To be revised |
| R4-2001668 | Noted |
| R4-2002066 | Noted |

## Discussion on 2nd round (if applicable)

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| **Company** | **Comments** |
| MTK | Sub topic 4-1: Option 2. We agree with QC’s proposal. RAN4 can define the requirement by ourselves, but we shall also make our requirement align with RAN1’s spec.  |
| NEC | Sub-topic 4-4: Since 4 companies are OK to study it in Rel-17 time frame, can we agree that this topic solution can be studied in Rel-17. Any views on CR 2001015? If it is not agreeable as it is, any revised version is agreeable?  |
| ZTE | Sub topic 4-4: Yes we also think we should study this issue a bit further later on. As to the CR, we don’t think it’s an urgent matter and without solid solutions there’s not much use for a Note. The Note suggests the network should be aware of this issue, but then what to do? So, we think it’s more proper to wait till companies bring possible solutions. At this stage, it’s too early for a CR since the group hasn’t come to any consensus yet. |
| NEC | Since Nokia and ZTE feel that note may not be required in the spec, we propose to capture an agreement in the chairman notes saying that “solution to TCI state mismatch problem is studied in Rel-17 time frame”. |
| QC | For sub-topic 4-1, we think it is hard to get to agreements in this meeting. However, we would encourage companies to bring some contributions on how to resolve the mis-match in next meeting.  |

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| **CR/TP number** | **Comments collection** |
| R4-2002211(revised from R4-2001026) | To Nokia:Transmit PUSCH is related to spatial relation and will be defined in active spatial relation switching delay which is under discussing on topic #62. If the target TCI state is unknown, the UE shall execute L1-RSRP measurement with CSI-RS which shall be set with Repition ON, otherwise it cannot be used to Rx beam sweeping.Nokia: replied on the reflector. With the changes mentioned in the email a revised 2211 should be agreeable:As for change 3 I still believe this should be changed once we have UL spatial requirements ready. Hence, this change 3 is not ok. For same reason change 5 is not ok now.Change 4 we still keep our concern stated below:Then concerning adding CSI-RS not being received – I am bit concerned. I mean we start to add this here we would have to start to change all over the specification and possibly add all other signals as well. If in general the UE is not required to receive or transmit during the TCI state switching period then we can write that. But let’s get common understanding before agreeing to this change.We are fine with Apples changes. |

## 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**  |
| R4-2001015 | Noted |
| R4-2002211 | Agreeable |
| R4-2002327 | Agreeable |

# Topic #5: BWP switching requirements (6.10.8.5)

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

## Companies’ contributions summary

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| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2000906 | ZTE Corporation | 1. The description “The UE is not required to transmit UL signals or receive DL signals after *bwp-InactivityTimer* [2] expires” should be modified because the UE is not required to transmit during the delay, but shall transmit afterwards.
2. The new TCI state is eventually configured by DCI. MAC CE only gives a active TCI state list, which is not specific enough for the UE to determine its new TCI state.
 |
| R4-2000907 | ZTE Corporation | Cat-A CR of R4-2000907 |
| R4-2001586 | Huawei, HiSilicon | The wording of BWP switch delay is changed as follows:1. For DCI-based BWP switch UE shall be able to receive or transmit on the new BWP on the serving cell on which BWP switch on the first DL or UL slot occurs right after TBWPswitchDelay after the beginning of DL slot n, as depicted in following figures.
2. Similar wording changing also applies to Timer-based BWP switching and RRC based BWP switching
 |
| R4-2001587 | Huawei, HiSilicon | Cat-A CR of R4-2001586 |

## Companies views’ collection for 1st round

### 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** |
| R4-2000906 | MTK: The changes on RRC-based BWP switch are not correct. * The MAC CE should be kept because after BWP switch, what UE gets are 2 BWP-specific new TCI lists in RRC (tci-StatesToAddModList and tci-StatesPDCCH-ToAddList). UE needs to wait for update via MAC CE in order to decode PDCCH and PDSCH based on new TCI state.
* The wording ‘configured’ is incorrect, either. ‘Configure’ is generally used for RRC, but here the TCI-state update is via MAC CE
 |
| ZTE: Thank MTK for careful review and comments. OK we agree that the wording can be changed, e.g. to change configured to updated. Propose to revise the CR to reflect changes suggested by MTK.Huawei, HiSilicon:We share the same views as MTK. The TCI is updated for PDCCH and PDSCH decoding. We suggest to change the expression of “old TCI” to more specific wording. “use old TCI state” could be change to “assume the DMRS of PDCCH and PDSCH are QCL’ed with the ones before the BWP switch…” |
| Nokia: initial change seems agreeable. Second change needs more discussion. |
| R4-2001586 | MTK: The intention of the CR is to resolve the reference slot timing change due to SCS change, but the revision does not really resolve this issue. TBWPswitchDelay is actually a duration of time, not an absolute time instant, it is strange to say ‘after TBWPswitchDelay’. Same issue happens in the RRC part. |
| Ericsson: the current wording in the specification is Ok, the proposed change will only create more confusion |
| Nokia: We understand the intention of the change however the change itself is not clear. We suggest working on the wording to capture the requirement more precisely. |

## Summary for 1st round

### CRs/TPs

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

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| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation**  |
| R4-2000906 | To be revised |
| R4-2001586 | To be revised |

## Discussion on 2nd round (if applicable)

## Summary on 2nd round (if applicable)

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

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| --- | --- |
| **CR/TP/LS/WF number** | **T-doc Status update recommendation**  |
| R4-2002212 | Agreeable |
| R4-2000907 | To be revised |
| R4-2002213 | Agreeable |
| R4-2001587 | Agreeable |