**3GPP TSG-RAN WG4 Meeting # 97-e-Bis R4-20xxxxx**

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

**Agenda item:** 7.5.2, 7.5.2.2, 7.5.3.1, 7.5.3.2 (applicable parts)

**Source:** Moderator (Ericsson)

**Title:** Email discussion summary for [97e][211] LTE\_NR\_DC\_CA\_RRM\_2

**Document for:** Information

# Introduction

This email discussion is intended to cover select MR-DC topics in

* AI 7.5.2 (\*) RRM core requirements maintenance (38.133/36.133)
	+ AI 7.5.2.2 Efficient and low latency serving cell configuration, activation and setup
* AI 7.5.3 RRM perf. requirements (38.133) (\*)
	+ AI 7.5.3.1 General (\*)
	+ AI 7.5.3.2 Test cases (\*)

(\*) Proposals pertaining to *Direct SCell activation*, *SCell dormancy*, *Cross carrier scheduling of active BWP switching*, and *Interruptions due to CA with non-aligned frame borders*. Proposals related to *Early measurement reporting* are handled in thread [97e][210] LTE\_NR\_DC\_CA\_RRM\_1.

The following issues are to be discussed during first round:

* Topic #1: Core requirement maintenance
	+ Sub-topic 1-1: Direct SCell Activation
		- Issue 1-1-1: Starting point for interruption window at Direct SCell activation
		- Issue 1-1-2: TCI state activation at Direct SCell activation
	+ Sub-topic 1-2: SCell dormancy
		- Issue 1-2-1: Removal of Editor’s Note following RAN1 agreement
		- Issue 1-2-2GTW: Rate of ACK/NACK feedback loss on non-dormant serving cells resulting from CQI measurements and RRM measurements on dormant SCells
		- Issue 1-2-3: Delay requirement for switching of multiple SCells between dormancy and non-dormancy
* Topic #2: Non-aligned frame borders and interruptions
	+ Sub-topic 2-1: Non-aligned frame borders
		- Issue 2-1-1: Clarify the CA with non-aligned frame border scenario
* Topic #3: Cross Carrier scheduling of Active BWP switch
	+ Sub-topic 3-1: Active BWP switching delay under Cross Carrier Scheduling
		- Issue 3-1-1GTW: Active BWP switching delay for single CC
		- Issue 3-1-2GTW: Active BWP switching delay for multiple CCs
* Topic #4: Test cases
	+ Sub-topic 4-1: Test case list for Direct SCell activation
		- Issue 4-1-1: RAT combinations to be covered
		- Issue 4-1-2: Frequency range combinations to be covered
		- Issue 4-1-3: Number of SCells to be directly activated
		- Issue 4-1-4GTW: Functionality to be tested
	+ Sub-topic 4-2: Test case list for SCell dormancy
		- Issue 4-2-1: RAT combinations to be covered
		- Issue 4-2-2: Frequency range combinations to be covered
		- Issue 4-2-3: Number of SCells in test cases
		- Issue 4-2-4: SCS configurations
		- Issue 4-2-5: DCI formats and triggering occasion
		- Issue 4-2-6: Testing of multiple requirements in single test case or multiple test cases
	+ Sub-topic 4-3: Time plan for performance part
		- Issue 4-3-1: Time plan for development of MR-DC test cases

The following issues are to be discussed during second round:

* Continue discussion from first round.
	+ Issue 1-1-2: TCI state activation at Direct SCell activation
	+ Issue 1-2-3: Delay requirement for switching of multiple SCells between dormancy and non-dormancy
	+ Issue 4-1-2: Frequency range combinations to be covered
	+ Issue 4-1-5: Direct SCell activation test applicability rule for UE supporting both EN-DC and SA (NEW)
	+ Issue 4-2-5: DCI formats and triggering occasion
	+ Issue 4-2-7: SCell dormancy test applicability rule for UE supporting both EN-DC and SA (NEW)
* Test case list and work split.

Please follow these instructions:

* use track changes when providing comments
* suffix the updated file with your company’s name
* do not step up version number of this document (only done by moderator)

# Topic #1: Core requirement maintenance

## Companies’ contributions summary

Contributions, excluding Change Requests:

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| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [R4-2014363](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014363.zip) | MediaTek inc. | «Discussion on direct Scell activation» (7.5.2.2)Observation 1: In NR, additional TCI state activation is required for SCell activation in order to let both network and UE know which Tx/Rx beams should be assumed for later data transmission/reception. However, TCI-state activation is not included in current RRC signaling for direct SCell activation.Observation 2: The benefit of introducing direct SCell activation is not realized because network anyway still need to send MAC CE(s) later for TCI state activation.Proposal 1: Send an LS to RAN2 to inform that missing TCI state activation in RRC command for direct SCell activation prohibits both network and UE to realize the benefit of direction SCell activation feature and request RAN2 to resolve it in Rel-16.Please check contribution for wording of draft LS |
| [R4-2014629](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014629.zip) | MediaTek inc. | «Discussion on TCI state activation in direct SCell activation» (7.5.2.2)Identical to R4-2014363?  |
| [R4-2015301](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2015301.zip) | NEC | «Discussion on RRM requirements for SCell dormancy» (7.5.2.2)Proposal 1: RAN4 not to define separate capability for dormant BWP switching and to use same delay requirements for non-dormant and dormant BWP switching.  |
| [R4-2015744](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2015744.zip) | Huawei, HiSilicon | «Discussion on remaining issues in SCell dormancy and cross-carrier scheduled BWP switching» (7.5.2.2)Proposal 1: Remove the following editor note in 38.133 based on RAN1 agreement:*Editor’s Note: The requirements are defined in DCI-agnostic manner, if RAN1 decides that DCI 0\_1 and/or 1\_1 for triggering dormancy switch cannot be transmitted after the first 3 OFDM symbols in a slot, RAN4 can revise the specification text accordingly.*Proposal 2: *Covered in Topic #3* |
| [R4-2016570](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2016570.zip) | Qualcomm Incorporated | «Dormant and Non-dormant BWP switching» (7.5.2.2)Proposal 1:RAN4 to revisit the agreement made in RAN4#96-e meeting about “Interruption requirement due to SSB-based measurements and/or CSI-RE reception”, and refine it as follow:* + For Interruptions due to SSB-based measurements and/or CSI-RS reception:
	+ The total rate of ACK/NACK feedback loss on non-dormant serving cells resulting from CQI measurements and RRM measurements on dormant SCells, shall not exceed X%.
		- X=0.5 for non-dormant serving cell of which CC is not a part of contiguous CA with the dormant SCell
		- X=2 for non-dormant serving cell of which CC is a part of contiguous CA with the dormant SCells or of which CC is not in the same band as the dormant SCell

Proposal 2: Delay requirement for switching of multiple SCells between dormancy and non-dormancy is as follow:* + $T\_{MultipleDormantBWPSwitchDelay}=T\_{DormantBWPSwitchDelay}+D'\*(N-1)$ where
	+ *N*: For UE which is capable of per-FR gap, and no BWP switch involves SCS change, *N* is the number of simultaneous dormant BWP switching on SCCs within the same frequency range; For UE which is not capable of per-FR gap, or the BWP switches on multiple SCCs involves SCS changing, *N* is the number of simultaneous dormant BWP switching on both FRs.
	+ $T\_{DormantBWPSwitchDelay}$: the longest dormant BWP switching delay per SCell that would have taken if each BWP switching had been triggered by SpCell DCI individually and non-simultaneously
	+ $D'$ is based on *D* of simultaneous BWP switching and has a separate capability as Table 1, i.e. UE can support different $D'$ from *D* for DCI/Timer based BWP switch

**Please check contribution for Table 1**Proposal 3: *Covered in Topic #3*Proposal 4: *Covered in Topic #3* |
| [R4-2016575](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2016575.zip) | Qualcomm Incorporated | «Staring point of an Interruption window at Direct SCell activation» (7.5.2)Moved from 7.5.1Proposal 1: RAN4 to remove HARQ-ACK time from the earliest possible starting point of an interruption window due to Direct SCell activation at SCell addition. |

Change Requests:

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| **T-doc number** | **Company** | **Title** |
| [R4-2015745](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2015745.zip) | Huawei, HiSilicon | «CR on BWP switching and SCell dormancy» (7.5.2.2) |
| [R4-2016020](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2016020.zip) | Ericsson | «CR 38.133 Removal of brackets for SCell Dormancy and Direct SCell Activation» (7.5.2.2) |
| [R4-2016021](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2016021.zip) | Ericsson | «CR 36.133 Removal of brackets for NR SCell Dormancy» (7.5.2.2) |
| [R4-2016584](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2016584.zip) | Qualcomm Incorporated | «CR to Staring point of an Interruption window at Direct SCell activation» (7.5.2.2)Moved from 7.5.1 |

## Open issues summary

### Sub-topic 1-1: Direct SCell Activation

**Issue 1-1-1: Starting point for interruption window at Direct SCell activation**

* Proposals
	+ Option 1 (Qualcomm): Remove HARQ-ACK time from the earliest possible starting point of an interruption window for Direct SCell activation (clauses 8.3.4 and 8.3.9).
* Recommended WF
	+ Moderator: Can we agree on Option 1?

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| **Company** | **Comments on issue 1-1-1** |
| Huawei | We support option 1. |
| Ericsson | We are fine with Option 1. |
| Apple | Support option 1. |
| MTK | Support option 1. |
| NEC | We are ok with option 1 |
| Qualcomm | Support Option 1 |
| ZTE | We are fine with Option 1 |
| vivo | Ok with option 1 |
| Nokia | We are fine with option 1 |

**Issue 1-1-2: TCI state activation at Direct SCell activation**

* Proposals
	+ Option 1 (MediaTek, Apple, NEC): Send LS to RAN2 on that missing TCI state activation in RRC command for Direct SCell activation reduces benefit of the feature.
* Recommended WF
	+ Moderator: Can we agree on Option 1?

*The topic was handled at the GTW session 2020-11-04, but no agreement was reached.*

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| **Company** | **Comments on issue 1-1-2** |
| Huawei | We agree that including TCI indication in the RRC command for direct activation can provide some benefits in some cases, but we suggest to discuss this enhancement in future releases considering the core part of the WI has already been completed, and that the change will impact both RAN2 signaling and UE implementation. Technically, TCI indication in not required in all SCell activation scenarios. In case when TCI indication is needed, NW can provide it closely after the RRC command for SCell activation, so the additional delay for TCI indication is not much. It is also noted that even TCI indication is separately provided from the RRC command for SCell activation, direct activation can still shorten the activation delay compared to MAC CE based activation. |
| Ericsson | We agree with MediaTek’s observation, but also with Huawei’s proposal in the comment above on considering this for future enhancement. There are scenarios where TCI state indication is not needed (e.g. single TCI state configured via RRC), and as Huawei points out, gNB can also provide TCI state indication shortly after the UE is expected to have processed the RRC command. |
| Apple | We support sending LS to RAN2 on this issue. Otherwise benefit of Direct SCell activation in FR2 would be quite limited. Even though network can somehow alleviate the problem by e.g. only configuring single TCI in the RRC, we believe some enhancement is still worthy. Having single TCI in the list is not that stable. Network may need to update the TCI list via RRC later, which will jeopardize the gain of direct SCell activation. We understand that we are at the very late stage of this WI. We can send LS to RAN2 and let them decide whether to enhance this in this WI, or TEI16, or even future release.  |
| MTK | We support option 1. TCI indication is always needed for the unknown cell cases. It seems to us that it is a “not completed” issue rather than an enhancement issue. It is a RAN2 leading topic and the final decision should be made in RAN2. |
| NEC | We are ok with sending LS to RAN2 regarding missing TCI indication for direct SCell activation.  |
| Qualcomm | Agree with the observation, and we support Option 1 in principle. But before getting there, we want to have a further investigation in RAN4, e.g. default TCI assumption in certain circumstances, because it’s also a bit unclear if network can always provide a proper TCI in RRC message even if signaling is introduced by RAN2. |
| ZTE | We think TCI state can be configured via *SCellConfig* already with existing signaling. We don’t think additional signaling is needed. |
| Nokia | We would need to distinguish configuration and activation. We agree with Huawei that this may be considered as an optimization which can be addressed in a later release. Additionally, we agree with Qualcomm that we should account any assumptions concerning default assumptions. |

### Sub-topic 1-2: Scell dormancy

**Issue 1-2-1: Removal of Editor’s Note following RAN1 agreement**

* Proposals
	+ Option 1 (Huawei): Remove Editor’s Note since related RAN1 agreement has been reached and is in line with existing specification text in 38.133.

*Editor’s Note: The requirements are defined in DCI-agnostic manner, if RAN1 decides that DCI 0\_1 and/or 1\_1 for triggering dormancy switch cannot be transmitted after the first 3 OFDM symbols in a slot, RAN4 can revise the specification text accordingly.*

* Recommended WF
	+ Moderator: Can we agree on Option 1?

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| **Company** | **Comments on issue 1-2-1** |
| Huawei | Support option 1 which is aligned with RAN1 agreement. |
| Ericsson | We are fine with Option 1. |
| Apple | Support option 1 |
| MTK | Support option 1 |
| Qualcomm | Support Option 1 |
| ZTE | Option 1 is fine. |
| vivo | Ok with option 1 |
| Nokia | We are fine removing the Editor’s note |

**Issue 1-2-2: Rate of ACK/NACK feedback loss on non-dormant serving cells resulting from CQI measurements and RRM measurements on dormant SCells**

* Proposals
	+ Option 1 (Qualcomm): Relax interruption requirements from X=0.5% to X=2% for non-dormant serving cell which either is intra-band contiguous to dormant serving cell, or is in a different band to the dormant serving cell.
* Recommended WF
	+ Moderator: Can we agree on Option 1?

*The topic was handled at the GTW session 2020-11-04, with the following outcome:*

Agreement: Rate of ACK/NACK feedback loss on non-dormant serving cells resulting from CQI measurements and RRM measurements on dormant SCells is X = 0.5% for each of CQI measurements and X = [1.0%] for RRM measurements

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| **Company** | **Comments on issue 1-2-2** |
| Huawei | We have some concern with option 1. We understand that a relaxed interruption requirements can allow more power saving from SCell dormancy, but >0.5% interruption is in our view too large from system impact pov. This would impact the attractiveness of the feature as NW may choose not to use dormancy to avoid interruptions. |
| Ericsson | We think the proposed relaxation of maximum interruption rate is too large and would carry a non-negligible impact on the system performance. In E-UTRA, the corresponding maximum interruption rate is 0.5% for CQI and RRM measurements on dormant Scells. The same number applies for intra- and inter-band CA (36.133 7.8.2.17-19). We do not immediately see that a higher interruption rate than specified for E-UTRA would be justified for NR. As Huawei points out, one risk with a higher interruption rate is that it may reduce the attractiveness of the feature for the network since it may harm important KPIs related e.g. to power consumption and system throughput.  |
| Apple | We are open. Motivation behind the proposal is rational. However, more study may be needed before concluding on 2%.  |
| MTK | We are fine with setting different X values for different cases. However, we need time to evaluate whether 2% is acceptable. |
| Qualcomm | If an interruption rate higher than 0.5% is too high, then at least we want to clarify that 0.5% is not a total interruption rate for CSI and RRM, i.e. at least 0.5% for each as LTE. |
| ZTE | In LTE there was extensive discussion on the X of missed ACK/NACK and 0.5% was finally agreed. Increasing the value of X would have impact to system performance. The intention is mainly for power saving, so the impact should be studied firstly.  |
| vivo | We are open to have a different x value for particular scenario if necessary.  |
| Nokia | 2% is high as discussed. It may lead to inefficient system performance. We can agree to have lost HARQ ack/nack requirements for both RRM and CSI. However, what matters will be final total sum of lost ack/nack. Having same interrupts as in LTE would be agreeable, while any increase would need to be justified. |

**Issue 1-2-3: Delay requirement for switching of multiple SCells between dormancy and non-dormancy**

* Proposals
	+ Option 1 (Qualcomm, Huawei, Ericsson, Apple, ZTE, vivo, Nokia): Introduce a capability D’ for dormant BWP switching of multiple SCells that is separate from corresponding capability D for active BWP switching.
	+ Option 2 (NEC): Do not define separate capabilities for dormant BWP switching of multiple SCells and the same for active BWP switching, respectively. Use same value D for both.
* Recommended WF
	+ Moderator: Discuss whether capabilities with respect to incremental processing time per carrier shall be different or the same for active BWP switching and dormant BWP switching.

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| **Company** | **Comments on issue 1-2-3** |
| Huawei | We support option 1 as it can also accommodate option 2, i.e. with option 1 UE can still report the same value for D for multi-CC BWP switch and multi-CC dormancy switch. |
| Ericsson | We are fine with Option 1. |
| Apple | We prefer option 1. |
| NEC | Since this is kind of enhancement we do no prefer adding new UE capability during maintenance part. Due to this we prefer option 2 |
| Qualcomm | Option 1. We don’t think this is an enhancement. We just want to allow UE to make better use of the following aspects (which are different from simultaneous non-dormant BWP switching):1. dormant BWP switching is indicated by one DCI
2. DCI triggering BWP switching into/out of dormancy of SCells can be transmitted only by SpCell, from which UE in general attempts to decode PDCCH with higher priority than those from SCells
 |
| ZTE | We are fine with option 1 as the intention is to have shorter delay for SCell dormancy. We also have feeling this may not make much difference in reality. |
| vivo | OK to have a separate set however prefer D’ = D |
| Nokia | The RAN4 requirements should allow better working UEs to benefit from performing better. |

## Companies views’ collection for 1st round

### CRs/TPs comments collection

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| **CR/TP number** | **Comments collection** |
| R4-2015745 | «CR on BWP switching and SCell dormancy», Huawei, HiSilicon |
| Ericsson: OK with removal of the note. For active BWP switching with cross carrier scheduling, need to wait for conclusion of Topic #3. |
| Qualcomm: Same view as Ericsson |
| Nokia: ok with removal of Editor’s note (hence, same view as Ericsson). |
| R4-2016584 | «CR to Staring point of an Interruption window at Direct SCell activation», Qualcomm |
| Huawei: OK |
| Ericsson: OK |
| Nokia: ok |
| R4-2016020 | «CR 38.133 Removal of brackets for SCell Dormancy and Direct SCell Activation», Ericsson |
| Huawei: OK |
| Nokia: ok (is it related to ack/nack %age discussion as well like R4-2016021?) |
| R4-2016021 | «CR 36.133 Removal of brackets for NR SCell Dormancy», Ericsson |
| Huawei: OK |
| Qualcomm: Needs to be clarified whether 0.5% for both CSI and RRM measurements for for each. Note that in LTE, it’s 0.5% for each. |
| Nokia: same as R4-2016020 |

## Summary for 1st round

### Open issues

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

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|  | **Status summary**  |
| **Sub-topic#1-1** | **Issue 1-1-1: Starting point for interruption window at Direct SCell activation**All nine companies commenting on the issue are supporting the following:Remove HARQ-ACK time from the earliest possible starting point of an interruption window for Direct SCell activation (clauses 8.3.4 and 8.3.9).The agreement is to be captured in CR R4-2016584. |
| **Issue 1-1-2: TCI state activation at Direct SCell activation**Eight companies have commented on the proposal. Three companies are supporting Option 1, one company sees no need for further signalling (new Option 2), and three companies are suggesting either that it is an optimization that best would be handled in a future release, and/or that some further discussions are needed to first understand whether introduction of TCI state activation in RRC command would lead to benefits.*Candidate options:** Option 1 (MediaTek, Apple, NEC): Send LS to RAN2 on that missing TCI state activation in RRC command for Direct SCell activation reduces benefit of the feature.
* Option 2 (ZTE): No new signalling needed, hence no LS to be sent.

*Recommendations for 2nd round:** Continue the discussion during second round.
* In case Option 1 is agreed, MediaTek is to provide the LS
* As the issue is related to Issue 4-1-2, exclude Direct SCell activation test case definition for FR1 – FR2 scenario until this issue has been resolved.

Agreement in favour of Option 1 is to be captured in LS. Other agreement or continued discussion is to be captured in WF on core maintenance. |
| **Sub-topic#1-2** | **Issue 1-2-1: Removal of Editor’s Note following RAN1 agreement**All eight companies commenting on the issue are supporting the following:Remove Editor’s Note since related RAN1 agreement has been reached and is in line with existing specification text in 38.133.*Editor’s Note: The requirements are defined in DCI-agnostic manner, if RAN1 decides that DCI 0\_1 and/or 1\_1 for triggering dormancy switch cannot be transmitted after the first 3 OFDM symbols in a slot, RAN4 can revise the specification text accordingly.*Agreement is to be captured in revision of CR R4-2015745. |
| **Issue 1-2-2: Rate of ACK/NACK feedback loss on non-dormant serving cells resulting from CQI measurements and RRM measurements on dormant SCells**The topic was handled at the GTW session 2020-11-04, with the following outcome:Rate of ACK/NACK feedback loss on non-dormant serving cells resulting from CQI measurements and RRM measurements on dormant SCells is X = 0.5% for each of CQI measurements and X = [1.0%] for RRM measurementsAgreement is to be captured in revisions of CRs R4-2016020 and R4-2016021. |
| **Issue 1-2-3: Delay requirement for switching of multiple SCells between dormancy and non-dormancy**Eigth companies have commented on the proposals, with seven companies in favour of Option 1 and one company in favour of Option 2.*Candidate options:** Option 1 (Qualcomm, Huawei, Ericsson, Apple, ZTE, vivo, Nokia): Introduce a capability D’ for dormant BWP switching of multiple SCells that is separate from corresponding capability D for active BWP switching.
* Option 2 (NEC): Do not define separate capabilities for dormant BWP switching of multiple SCells and the same for active BWP switching, respectively. Use same value D for both.

*Recommendations for 2nd round:** Continue discussion during second round to reach consensus.
* For CR revisions, assume Option 1 for now.

Agreement in favour of Option 1 is to be captured in revisions of CRs R4-2015305, R4-2015745, and R4-2015504. Agreement in favour of Option 2 is to be captured by further revision of the CRs if time permits; otherwise in WF on core maintenance. |

*Recommendations on WF/LS assignment*

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|  | **WF/LS t-doc Title**  | **Assigned Company,****WF or LS lead** |
| #1 | LS on TCI state indication at Direct SCell activation | MediaTek |
| #2 | WF on Core maintenance in MR-DC RRM 2  | Ericsson |

### CRs/TPs

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

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| **CR/TP number** | **CRs/TPs Status update recommendation**  |
| R4-2015745 | «CR on BWP switching and SCell dormancy», Huawei, HiSilicon***To be revised*** *to account for outcome of Issues 3-1-1 and 3-1-2* |
| R4-2016584 | «CR to Staring point of an Interruption window at Direct SCell activation», Qualcomm***Agreeable*** |
| R4-2016020 | «CR 38.133 Removal of brackets for SCell Dormancy and Direct SCell Activation», Ericsson***To be revised*** *to account for outcome of Issue 1-2-2* |
| R4-2016021 | «CR 36.133 Removal of brackets for NR SCell Dormancy», Ericsson***To be revised*** *to account for outcome of Issue 1-2-2* |

## Discussion on 2nd round (if applicable)

**Issue 1-1-2: TCI state activation at Direct SCell activation**

Eight companies have commented on the proposal. Three companies are supporting Option 1, one company sees no need for further signalling (new Option 2), and three companies are suggesting either that it is an optimization that best would be handled in a future release, and/or that some further discussions are needed to first understand whether introduction of TCI state activation in RRC command would lead to benefits.

*Candidate options:*

* + Option 1 (MediaTek, Apple, NEC): Send LS to RAN2 on that missing TCI state activation in RRC command for Direct SCell activation reduces benefit of the feature.
	+ Option 2 (ZTE): No new signalling needed, hence no LS to be sent.

*Recommendations for 2nd round:*

* Continue the discussion during second round.
* In case Option 1 is agreed, MediaTek is to provide the LS
* As the issue is related to Issue 4-1-2, exclude Direct SCell activation test case definition for FR1 – FR2 scenario until this issue has been resolved.

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| **Company** | **Comments in 2nd round on issue 1-1-2** |
| NEC | As discussed in GTW session, we are fine to inform about the missing TCI state information. It is upto RAN2 to work on the solution. |
| Apple | We support option 1. RAN2 can decide when/how to fix this. |
| Qualcomm | Option 1 |
| Huawei | Similar view as NEC and Apple. We can inform RAN2 about the issue, and it should be up to RAN2 whether/when/how to resolve it. |
| Ericsson | We support Option 1. |
| Nokia | We are fine to send LS. We have provided comments and believe the LS woud benefit froma slo being addressed to RAN1. Additionally, the LS should clarify whether this is for FR1, FR2 or both – our understanding is that the issue is present in FR1 and FR2.  |

**Issue 1-2-3: Delay requirement for switching of multiple SCells between dormancy and non-dormancy**

Eigth companies have commented on the proposals, with seven companies in favour of Option 1 and one company in favour of Option 2.

*Candidate options:*

* Option 1 (Qualcomm, Huawei, Ericsson, Apple, ZTE, vivo, Nokia): Introduce a capability D’ for dormant BWP switching of multiple SCells that is separate from corresponding capability D for active BWP switching.
* Option 2 (NEC): Do not define separate capabilities for dormant BWP switching of multiple SCells and the same for active BWP switching, respectively. Use same value D for both.

*Recommendations for 2nd round:*

* Continue discussion during second round to reach consensus.
* For CR revisions, assume Option 1 for now.

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| **Company** | **Comments in 2nd round on issue 1-2-3** |
| NEC | Though we still have same views as first round of discussion, since we are the only company opposing it, we are OK to compromise with majority view.  |
| Qualcomm | We believe Option 1 will allow UE to make the best use of its capability, thereby, bringing benefit to both UE and network. And for the dormant BWP switching capability D’, Table 1 in R4-2016570 can be used.  |
| Huawei | Same view as in first round. |
| Ericsson | Support Option 1.  |
| Moderator | It is noted that NEC kindly is willing to compromise to Option 1. Hence unless anyone else raise concern about Option 1, this issue is closed (and removed from the WF on core requirements maintenance).  |
| Nokia | Option 1 as it can add system benefits. |

### CRs/TPs comments collection 2nd round

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| R4-2017125(Revision of R4-2015745) | «CR on BWP switching and SCell dormancy», Huawei, HiSilicon |
| Nokia: ok |
| Company B |
|  |
| R4-2017304 (Revision of R4-2016020) | «CR 38.133 Removal of brackets for SCell Dormancy and Direct SCell Activation», Ericsson |
| Nokia: ok |
| Company B |
|  |
| R4-2017127 (Revision of R4-2016021) | «CR 36.133 Removal of brackets for NR SCell Dormancy», Ericsson |
| Nokia: ok |
| Company B |
|  |
| R4-2017124  | «LS on TCI state indication at Direct SCell activation», MediaTek |
| Company A |
| Company B |
|  |
| R4-2017123  | «WF on RRM Core requirements maintenance in MR-DC RRM 2», Ericsson |
| 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*

|  |  |
| --- | --- |
| **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: Non-aligned frame borders and interruptions

## Companies’ contributions summary

Contributions, excluding Change Requests:

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [R4-2014359](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014359.zip) | MediaTek inc. | «Discussion on interruption time for unaligned CA scenarios» (7.5.2)Proposal 1: RAN4 to clarify in the spec that for the CA with non-aligned frame boundaries scenario, total interruption time shall also consider and count the time duration of the slot which is partially overlapped with the measurement gap. |

Change Requests:

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Title** |
| [R4-2014360](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014360.zip) | MediaTek inc. | «CR on TS38.133 for interruption time for unaligned CA scenarios» (7.5.2) |

## Open issues summary

### Sub-topic 2-1: Non-aligned frame borders

**Issue 2-1-1: Clarify the CA with non-aligned frame border scenario**

* Proposals
	+ Option 1 (MediaTek): Clarify impact of CA with non-aligned frame borders on SCC interruption length due to measurement gaps. *(The total interruption time on an SCC may be additionally extended by one SCC slot due to slots partially overlapped with the measurement gap)*
* Recommended WF
	+ Moderator: Can we agree on Option 1?

|  |  |
| --- | --- |
| **Company** | **Comments on issue 2-1-1** |
| Huawei | Option 1 is reasonable in our view.  |
| Ericsson | We are fine with Option 1. |
| Apple | Support option 1. |
| MTK | Support option 1 |
| Qualcomm | Okay with Option 1. |
| CMCC | Technically the proposal is OK. However, unaligned CA is similar as synchronized DC. Both of them are slot boundary aligned, but with unaligned frame boudary. RAN4 didn’t not specify the case of partially overlapped slot for DC. If RAN4 is going to specify this for unaligned CA, should we also clarify the synchronized DC? |
| ZTE | We are fine with Option 1 |
| vivo | Ok with option 1. |
| Nokia | Fine to clarify this. But what are we agreeing to in option 1? The text in () is likely what is likely what needs to be defined? |

## Companies views’ collection for 1st round

### CRs/TPs comments collection

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| R4-2014360 | «CR on TS38.133 for interruption time for unaligned CA scenarios», MediaTek |
| Huawei: OK |
| Ericsson: OK |
| Qualcomm: Needs more time to check (agree in principle though) |
| CMCC: 1)- The total interruption time on an SCC may be additionally extended by one SCC slot due to slots partially overlapped with the measurement gap. The wording “may be additionally extended” is ambiguous. It is not sure whether additional interruption is needed and how long the additional interruption is needed. This may impact the network scheduling. 2)(a) Measurement gap with MGL = N(ms) with MG timing advance of 0ms for all serving cells in synchronous EN-DC, NR standalone operation (with single carrier, NR CA and synchronous NR-DC configuration) and synchronous NE-DC, and for serving cells in MCG in NR standalone operation (with asynchronous NR-DC configuration) with aligned CA frame boundariesThe added “with aligned CA frame boundaries” is not necessary |
| Nokia: Some changes would be needed as we do not see a need to split out the aligned frame boundary case but instead only list what would be the requirement if the frame boundaries are not aligned. |

## 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** | *Tentative agreements:**Candidate options:**Recommendations for 2nd round:* |
| **Sub-topic #2-1** | **Issue 2-1-1: Clarify the CA with non-aligned frame border scenario** All nine companies commenting on the issue are supporting the following agreement: Clarify impact of CA with non-aligned frame borders on SCC interruption length due to measurement gaps. *(The total interruption time on an SCC may be additionally extended by one SCC slot due to slots partially overlapped with the measurement gap)*Two companies have pointed out that that some further clarifications may be needed. Those are to be addressed in a revision of the accompanying CR R4-2014360.Agreement is to be captured in revision of CR R4-2014360. |

*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**  |
| R4-2014360 | «CR on TS38.133 for interruption time for unaligned CA scenarios», MediaTek***To be revised*** *to take into account comments on CR and on Issue 2-1-1.* |

## Discussion on 2nd round (if applicable)

### CRs/TPs comments collection 2nd round

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| R4-2017128(Revision of R4-2014360) | «CR on TS38.133 for interruption time for unaligned CA scenarios», MediaTek |
| Nokia: We have provided revised CR. Our view is that non-aligned frame boundaries should be covered but frame aligned scenario is baseline and common case. Hence, we should add requirements for non-aligned frame boundaries. From the CR it was not clear which figures and tables would be impacted by non-aligned frame boundaries. We have tried to clarify this in the revised CR, but it may still be unclear and may need to be clarified. At least we understand that figure c and d may be illustrative(?) but not clear if table 9.1.2-4a is representing the interrupted slots in case of non-aligned frame boundaries? If this is the case this should be captured. |
| 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*

|  |  |
| --- | --- |
| **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: Cross Carrier scheduling of Active BWP switch

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

## Companies’ contributions summary

Contributions, excluding Change Requests:

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [R4-2015744](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2015744.zip) | Huawei, HiSilicon | «Discussion on remaining issues in SCell dormancy and cross-carrier scheduled BWP switching» (7.5.2.2)Proposal 1: *Covered in Topic #1*Proposal 2: Reuse the dormancy switching delay requirements for BWP switching triggered by cross-carrier scheduling* BWP switching delay is relaxed by 1 slot w.r.t. the smaller SCS between the scheduling cell and the scheduled cell compared to the existing BWP switching delay
 |
| [R4-2016570](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2016570.zip) | Qualcomm Incorporated | «Dormant and Non-dormant BWP switching» (7.5.2.2)Proposal 1:*Covered in Topic #1*Proposal 2: *Covered in Topic #1*Proposal 3: Delay requirement for cross-carrier scheduling DCI based BWP switching between non-dormant BWPs on a single Cell is as follow:* + *TBWPswitchDelay* in Table 8.6.2-1 plus [1] slot
	+ In case SCS differs between scheduling cell and scheduled cell, the BWP switch delay, i.e. the increased *TBWPswitchDelay* by [1] slot, is determined by the smallest one, i.e. minimum of {BWP SCS of the scheduling cell, SCS of active BWP immediately before the BWP switching on the scheduled cell, SCS of active BWP immediately after the BWP switching on the scheduled cell}

Proposal 4: Delay requirement for cross-carrier scheduling DCI based simultaneous BWP switching between non-dormant BWPs on multi-Cells is as follow:* + $T\_{MultipleBWPSwitchDelay}=T\_{BWPSwitchDelay}+D\*(N-1)$ where
	+ *N* and *D*: the same definition as those defined for simultaneous BWP switching on multiple cells.
	+ $T\_{BWPSwitchDelay}$: the longest non-dormant BWP switching delay per cell that would have taken if each BWP switching had been triggered by a self- or cross-carrier scheduling DCI non-simultaneously plus additional [1] slot with respect to the smallest SCS between all involved BWPs
 |
| [R4-2015304](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2015304.zip) | NEC | «Discussion on cross carrier BWP switch delay requirements for single and multiple CC» (7.5.2)Moved from 7.13.1.3Proposal 1: DCI based BWP switching delay is relaxed by one slot w.r.t single and multiple CC BWP switching delay, when DCI is received/scheduled using cross-carrier scheduling. |
| [R4-2016427](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2016427.zip) | Ericsson | «On Active BWP switching under cross-carrier scheduling» (7.5.2)Moved from 7.13.1.3Proposal 1: RAN4 shall base cross carrier scheduling margin for active BWP switching on the RAN1 agreements for minimum margin between PDCCH on scheduling carrier and PDSCH on scheduled carrier.Proposal 2: For active BWP switching on single carrier, the following shall apply: When active BWP switching is triggered through cross carrier scheduling, UE shall finish within the time duration TccsBWPswitchDelay =TBWPswitchDelay+Y, where TBWPswitchDelay is defined in Table 8.6.2-1, and Y is defined as follows:* if SCS is same in scheduling as in scheduled cell, Y = 0.
* if SCS is different in scheduling cell and scheduled cell, Y is the time in symbol durations in the numerology µPDCCH for the scheduling carrier, as given below.

|  |  |
| --- | --- |
| µPDCCH | Y [symbol durations] |
| 0 | 4 |
| 1 | 5 |
| 2 | 10 |
| 3 | 14 |

Proposal 3: For active BWP switching on multiple carriers, the following shall apply: When active BWP switching is triggered through cross carrier scheduling, UE shall finish within the time duration TccsMultipleBWPswitchDelay =TMultipleBWPswitchDelay+Y, where TMultipleBWPswitchDelay is defined in clause 8.6.2A.1, and Y is defined as follows:* if SCS is same in scheduling as in scheduled cell, Y = 0.
* if SCS is different in scheduling cell and scheduled cell, Y is the time in symbol durations in the numerology µPDCCH for the scheduling carrier, as given below.

|  |  |
| --- | --- |
| µPDCCH | Y [symbol durations] |
| 0 | 4 |
| 1 | 5 |
| 2 | 10 |
| 3 | 14 |

 |
| [R4-2015506](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2015506.zip) | Huawei, HiSilicon | «Discussion on requirements maintenance for BWP switch on multiple CCs» (7.5.2)Moved from 7.13.1.3Proposal 1: UE shall finish BWP switch within the time duration TMultipleBWPswitchDelay ­if the serving cell where UE receives DCI for BWP switch is same as the serving cell on which BWP switch occurs for each involved serving cell, which is defined as: TMultipleBWPswitchDelay = TBWPswitchDelay + D\*(N-1)  Where:* TBWPswitchDelay is the BWP switching delay on single CC defined in Table 8.6.2-1 depending on UE capability *bwp-SwitchingDelay* [2]. TBWPswitchDelay shall be based on the smallest SCS among SCS of all involved CCs before and after BWP switch. If the BWP switch on multiple CCs results in the change of the SCS on any CC among involved CCs, TBWPswitchDelay should be based on the smallest SCS among all SCS values of all involved CCs.
* D is the incremental delay for each additional CC involved in simultaneous BWP switch and depends on UE capability *bwp-SwitchingMultiCCs-r16* [13].
* For UE which is capable of per-FR gap, and no BWP switch involves SCS change, N is the number of CCs in same FR; For UE which is not capable of per-FR gap, or the BWP switches on any CC involves SCS changing, N is the number of CCs undergoing simultaneous BWP switch.

 UE shall finish BWP switch within the time duration TMultipleBWPswitchDelay + Y ­if the serving cell where UE receives DCI for BWP switch is different from the serving cell on which BWP switch occurs for any involved serving cell, where Y = 1 slot corresponding to the smaller value between SCS of the serving cell where UE receives the BWP switch request and the SCS of the serving cell where BWP switch occurs before and after BWP switch.  |

Change Requests:

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Title** |
| [R4-2015745](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2015745.zip) | Huawei, HiSilicon | «CR on BWP switching and SCell dormancy» (7.5.2.2) |
| [R4-2015305](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2015305.zip) | NEC | «CR to TS 38.133 on DCI based BWP switch requirements for cross carrier scheduling» (7.5.2)Moved from 7.13.1.3 |
| [R4-2016428](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2016428.zip) | Ericsson | «CR 38.133 Active BWP switching with cross-carrier scheduling» (7.5.2)Moved from 7.13.1.3 |
| [R4-2015504](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2015504.zip) | Huawei, HiSilicon | «CR on active BWP switching delay on multiple CCs» (7.5.2)Moved from 7.13.1.3 |

## Open issues summary

### Sub-topic 3-1: Active BWP switching delay under Cross Carrier Scheduling

**Issue 3-1-1: Active BWP switching delay for single CC**

* Proposals
	+ Option 1a (Huawei): Active BWP switching delay is relaxed by 1 slot at smaller SCS of scheduling and scheduled cells when cross carrier scheduling is used.
	+ Option 1b (Qualcomm): Active BWP switching delay is relaxed by 1 slot at smaller SCS of scheduling cell, scheduled cell before and scheduled cell after active BWP change when cross carrier scheduling is used.
	+ Option 1c (NEC): Active BWP switching delay is relaxed by 1 slot when cross carrier scheduling is used.
	+ Option 2 (Ericsson): Active BWP switching delay is relaxed by Y OFDM symbol durations at SCS of scheduling cell (µPDCCH) when cross carrier scheduling is used.
		- If SCS of scheduling and scheduled cells are the same: Y=0
		- If SCS of scheduling and scheduled cells are different:

|  |  |
| --- | --- |
| µPDCCH | Y [symbol durations] |
| 0 | 4 |
| 1 | 5 |
| 2 | 10 |
| 3 | 14 |

* Recommended WF
	+ Moderator: Narrow down options. Can Options 1a/1b/1c be merged into one? To me it seems the difference between Option 1a and Option 1b is that the latter is providing details also on how the delay depends on a potential SCS change in the scheduled cell. Hence there seems not to be a conflict between Options 1a and 1b. Similarly, Option 1c contains less details and seems not to be in conflict with any of Options 1a and 1b.

*The topic was handled at the GTW session 2020-11-04, with the following outcome:*

Agreement: Active BWP switching delay is relaxed by 1 slot at smaller SCS of scheduling cell, scheduled cell before and scheduled cell after active BWP change when cross carrier scheduling is used.

|  |  |
| --- | --- |
| **Company** | **Comments on issue 3-1-1** |
| Huawei | We support option 1b. We agree with moderator’s observation regarding the similarity between option 1a, 1b and 1c, and to us option 1b is the most accurate one.On option 2, we understand the refereed table from clause 5.5 of 38.214 is for reception of cross-carrier scheduled PDSCH. For PDSCH reception, the concern is about the buffer size, i.e. the time point when UE starts to buffer samples for PDSCH. When SCS of scheduling and scheduled cells are the same, UE is required to buffer from the beginning of the slot on the scheduled cell, without knowing whether PDSCH is scheduled or not. Although not optimal from UE perspective, this is still possible. However, DCI based BWP switching is different. UE would start BWP switching related process only after it decodes the DCI, and the concern is about the shortened processing time due to cross-carrier scheduling, e.g. as we discussed in our paper. To account for the challenges, RAN4 has agreed on option 1b for dormancy switch. As BWP switch and dormancy switch are very similar, it is reasonable to apply the same requirements for cross-carrier scheduled BWP switch. |
| Ericsson | We are OK with Option 1b. It makes sense to use a similar approach as for SCell dormancy switching. |
| Apple | Support option 1b. |
| MTK | We would like to propose another option 1d. 1d) **For type 1 UE**, active BWP switching delay is relaxed by 1 slot at smaller SCS of scheduling and scheduled cells when cross carrier scheduling is used. |
| NEC | We are ok with option 1b |
| Qualcomm | Share the same view as Huawei. For a consistent principle about multiple numerologies between cells and BWPs, we support Option 1b. |
| ZTE | We are fine with option 1b. |
| vivo | support option 1b |
| Nokia | handled in GTW and we’re fine with option 1b |

**Issue 3-1-2: Active BWP switching delay for multiple CCs**

* Proposals
	+ Option 1a (Huawei): Active BWP switching delay is relaxed by 1 slot at smaller SCS of scheduling and scheduled cells when cross carrier scheduling is used.
	+ Option 1b (Qualcomm): Active BWP switching delay is relaxed by 1 slot at smaller SCS of scheduling cell, scheduled cells before and scheduled cells after active BWP change when cross carrier scheduling is used. $T\_{BWPSwitchDelay}$ is clarified as being the longer $T\_{BWPSwitchDelay}$ for any of the scheduled cells, had each scheduled cell been the only one triggered.
	+ Option 1c (NEC): Active BWP switching delay is relaxed by 1 slot when cross carrier scheduling is used.
	+ Option 2 (Ericsson): Active BWP switching delay is relaxed by Y OFDM symbol durations at SCS of scheduling cell (µPDCCH) when cross carrier scheduling is used.
		- If SCS of scheduling and scheduled cells are the same: Y=0
		- If SCS of scheduling and scheduled cells are different:

|  |  |
| --- | --- |
| µPDCCH | Y [symbol durations] |
| 0 | 4 |
| 1 | 5 |
| 2 | 10 |
| 3 | 14 |

* Recommended WF
	+ Moderator: Narrow down options. Can Options 1a/1b/1c be merged into one (see also 3-1-1)? Is there any difference in interpretation of $T\_{BWPSwitchDelay}$ between Options 1a and 1b?

*The topic was handled at the GTW session 2020-11-04, with the following outcome:*

Agreement: Active BWP switching delay is relaxed by 1 slot at smaller SCS of scheduling cell, scheduled cells before and scheduled cells after active BWP change when cross carrier scheduling is used. $T\_{BWPSwitchDelay}$ is clarified as being the longer $T\_{BWPSwitchDelay}$ for any of the scheduled cells, had each scheduled cell been the only one triggered.

|  |  |
| --- | --- |
| **Company** | **Comments on issue 3-1-2** |
| Huawei | We support option 1b for the same comments as for 3-1-1. On the interpretation of TBWPswitchDelay, we can maybe discuss it in the CR. We prefer to keep TBWPswitchDelay same as today, i.e. it is only for self-scheduling case. Similarly, TMultipleBWPswitchDelay is only for self-scheduled multi-CC BWP switching. In this way, the existing requirements for SCell dormancy, which are referring to TBWPswitchDelay and TMultipleBWPswitchDelay, would not be impacted. |
| Ericsson | We are OK with Option 1b. |
| Apple | Support option 1b. |
| MTK | We would like to propose another option 1d. 1d) **For type 1 UE**, active BWP switching delay is relaxed by 1 slot at smaller SCS of scheduling and scheduled cells when cross carrier scheduling is used. |
| NEC | We are ok with option 1b |
| Qualcomm | With the same reason, support Option 1b. |
| ZTE | We are fine with option 1b. |
| Vivo | Ok with option 1b |
| Nokia | can support option 1b |

## Companies views’ collection for 1st round

### CRs/TPs comments collection

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| R4-2015745 | «CR on BWP switching and SCell dormancy», Huawei, HiSilicon |
| Ericsson: Some modification might be needed to capture final agreement for BWP switching on single CC, but otherwise we are fine. |
| Qualcomm: For “the smaller value between the SCS of the serving cell where UE receives BWP switching request and the SCS of the serving cell where BWP switching occurs.”, there can be 2 SCSs in the serving cell where BWP switching occurs, i.e. BWPs before/after BWP switching application. It will be better to clarify it, though it’s pending on sub-topic 3-1-1/2. |
| R4-2015305 | «CR to TS 38.133 on DCI based BWP switch requirements for cross carrier scheduling», NEC |
| Huawei: in this CR the additional slot for cross-carrier scheduled BWP switch is w.r.t. SCS of the scheduled cell. This is different from the requirements for dormancy switch, and we prefer to align requirements for the two. |
| Qualcomm: Same view as Huawei, and pending issue on sub-topic 3-1-1/2. |
| R4-2016428 | «CR 38.133 Active BWP switching with cross-carrier scheduling», Ericsson |
| Huawei: Please refer to our comments as for sub-topic 3-1. |
| Ericsson: We suggest capturing the outcome in CRs R4-2015745/R4-2015504, and not pursue this one.  |
| R4-2015504 | «CR on active BWP switching delay on multiple CCs», Huawei, HiSilicon |
| Ericsson: Some modification might be needed to capture final agreement for BWP switching on multiple CCs, but otherwise we are fine. |
| Qualcomm: Pending other sub-topics. |

## 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: Active BWP switching delay for single CC**The topic was handled at the GTW session 2020-11-04, with the following outcome:Active BWP switching delay is relaxed by 1 slot at smaller SCS of scheduling cell, scheduled cell before and scheduled cell after active BWP change when cross carrier scheduling is used.Agreement is to be captured in revisions of CRs R4-15305, R4-2015745, and R4-2015504. |
| **Issue 3-1-2: Active BWP switching delay for multiple CCs**The topic was handled at the GTW session 2020-11-04, with the following outcome:Active BWP switching delay is relaxed by 1 slot at smaller SCS of scheduling cell, scheduled cells before and scheduled cells after active BWP change when cross carrier scheduling is used. $T\_{BWPSwitchDelay}$ is clarified as being the longer $T\_{BWPSwitchDelay}$ for any of the scheduled cells, had each scheduled cell been the only one triggered.Agreement is to be captured in revisions of CRs R4-15305, R4-2015745, and R4-2015504. |

*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**  |
| R4-2015745 | «CR on BWP switching and SCell dormancy», Huawei, HiSilicon***To be revised*** *to take comments on CR into account* |
| R4-2015305 | «CR to TS 38.133 on DCI based BWP switch requirements for cross carrier scheduling», NEC***Return to*** |
| R4-2016428 | «CR 38.133 Active BWP switching with cross-carrier scheduling», Ericsson***Not pursued*** |
| R4-2015504 | «CR on active BWP switching delay on multiple CCs», Huawei, HiSilicon***To be revised*** *to take comments on CR into account* |

## Discussion on 2nd round (if applicable)

### CRs/TPs comments collection 2nd round

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| R4-2017125 (Revision of R4-2015745) | «CR on BWP switching and SCell dormancy», Huawei, HiSilicon |
| Company A |
| Company B |
|  |
| R4-2017323(Revision of R4-2015305) | «CR to TS 38.133 on DCI based BWP switch requirements for cross carrier scheduling», NEC |
| Company A |
| Company B |
|  |
| R4-2017129 (Revision of R4-2015504) | «CR on active BWP switching delay on multiple CCs», Huawei, HiSilicon |
| 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*

|  |  |
| --- | --- |
| **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 cases

## Companies’ contributions summary

Contributions, excluding Change Requests:

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [R4-2014368](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014368.zip) | MediaTek inc. | «Discussion on performance part for SCell dormancy» (7.5.3.1)Observation 1: The delay requirement of switching between non-dormancy and dormancy reuse DCI-based active BWP switch delay requirement.Proposal 1: RAN4 can take the performance part of DCI-based active BWP switching as reference to design the SCell dormancy test case.Proposal 2: RAN4 only need to test the SCell dormancy requirement in the scenarios as following:* EN-DC mode: E-UTRAN - NR PSCell FR1 with FR1 SCell
* EN-DC mode: E-UTRAN - NR PSCell FR2 with FR2 SCell
* SA mode: NR FR1 – NR FR1
* SA mode: NR FR2 – NR FR2
* SA mode: NR FR1 – NR FR2

Proposal 3: Both requirements for BWP switch delays from dormancy to non-dormancy and from non-dormancy to dormancy are tested in one SCell dormancy test case.Observation 2: For scenarios with BWP switch on multiple CCs, the HARQ-ACK information for DCI format 1\_1 indicating SCell dormancy may not be transmitted successfully.Proposal 4: For scenarios with BWP switch on multiple CCs test case, two actions are suggested in RAN4 as follows:* Option 1: Not to define the test case for multiple SCells dormancy in RRM performance part.
* Option 2: Wait for RAN1 feedback and study on whether the test case for multiple SCells dormancy shall be defined in RRM performance part or not.
 |
| [R4-2015749](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2015749.zip) | Huawei, HiSilicon | «Discussion on RRM test for MR-DC enhancement» (7.5.3.2)Proposal 1 is covered in thread [97e][210] LTE\_NR\_DC\_CA\_RRM\_1 (EMR)Proposal 2: Define the following 4 test cases for direct SCell activation* TC1: Direct activation at SCell addition of a single known SCell in FR1 when UE is in EN-DC
* TC2: Direct activation at SCell addition of a single known SCell in FR2 when UE is in EN-DC
* TC3: Direct activation at SCell addition of a single known SCell in FR1 when UE is in NR SA
* TC4: Direct activation at SCell addition of a single known SCell in FR2 when UE is in NR SA

Proposal 3a: Define the following 6 test cases for SCell dormancy switch.* TC1: EN-DC, single SCell in FR1, DCI 0\_1/1\_1 within first 3 OFDM symbol
* TC2: EN-DC, multiple SCells in FR1, DCI 2\_6 within first 3 OFDM symbol
* TC3: EN-DC, single SCell in FR2, DCI 0\_1/1\_1 after first 3 OFDM symbol
* TC4: NR SA, multiple SCells in FR1, DCI 0\_1/1\_1 after first 3 OFDM symbol
* TC5: NR SA, multiple SCells in FR2, DCI 2\_6 after first 3 OFDM symbol
* TC6: NR SA, single SCell in FR2, DCI 0\_1/1\_1 within first 3 OFDM symbol

Proposal 3b: Define the following 4 test cases for RRM/CSI measurement during SCell dormancy.* TC1: EN-DC and SCell in FR1
* TC2: EN-DC and SCell in FR2
* TC3: NR SA and SCell in FR1
* TC4: NR SA and SCell in FR2
 |
| [R4-2016017](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2016017.zip) | Ericsson | «General discussion on MR-DC RRM test cases» (7.5.3.1)See the contribution for justification of test case list |
| [R4-2016018](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2016018.zip) | Ericsson | «MR-DC RRM test case list and time plan» (7.5.3.2)Proposal 1: RAN4 develops test cases for MR-DC based on the test case list in Table 1.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Group of requirements** | **Require-ment section** | **Test cases** | **Test case top section** | **Volunteering company** |
| Direct SCell Activation | 8.2,8.3.4, 8.3.9 | SCell addition with direct activation in FR1* NR FR1 PCell, direct activation upon addition of known NR FR1 SCell
 | A.6.5 (NR FR1) |  |
| SCell addition with direct activation in FR2* NR FR1 PCell, direct activation upon addition of known NR FR2 SCell
* NR FR2 PCell, direct activation upon addition of intra-band NR FR2 SCell
 | A.7.5 (NR FR2) | Ericsson |
| 8.2, 8.3.5, 8.3.10 | Handover with direct activation of SCell in FR1* NR FR1 PCell, direct activation of known NR FR1 SCell upon handover
 | A.6.5 (NR FR1) |  |
| Handover with direct activation of SCell in FR2* NR FR1 PCell, direct activation of known NR FR2 SCell upon handover
* NR FR2 PCell, direct activation of intra-band NR FR2 SCell upon handover
 | A.7.5 (NR FR2) | Ericsson |
| 8.2, 8.3.6, 8.3.11 | RRC resume with direct activation of SCell in FR1* NR FR1 PCell, direct activation upon RRC Resume of unknown NR FR1 SCell
 | A.6.5 (NR FR1) |  |
| RRC resume with direct activation of SCell in FR2* NR FR2 PCell, direct activation upon RRC Resume of intra-band NR FR2 SCell
 | A.7.5 (NR FR2) |  |
| SCell Dormancy | 8.2, 8.6.2,8.6.2A | Dormancy switching of SCell(s) in FR1* NR FR1 PCell, dormancy switching of single NR FR1 SCell
* NR FR1 PCell, dormancy switching of multiple NR FR1 SCells
 | A.6.5 (NR FR1) |  |
| Dormancy switching of SCell(s) in FR2* NR FR2 PCell, dormancy switching of single NR FR2 SCell
* NR FR1 PCell, dormancy switching of NR FR1 SCell and NR FR2 SCell
* NR FR2 PCell, dormancy switching of multiple NR FR2 SCells
 | A.7.5 (NR FR2) | Ericsson |

EMR test cases are covered in thread [97e][210] LTE\_NR\_DC\_CA\_RRM\_1Proposal 2: Time plan for developing MR-DC test cases:* RAN4#97-e (November 2020):
	+ Agree on high-level list for test cases.
	+ Agree on work split between interested companies.
* RAN4#98-e (January 2021):
	+ Provide draft CRs for test cases.
* RAN4#98bis-e (April 2021):
	+ Provide final CRs for test cases.
 |
| [R4-2016571](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2016571.zip) | Qualcomm Incorporated | «Performance requirements for Dormant SCell» (7.5.3.1)Proposal 1: RAN4 to define performance test cases for dormant SCell requirements based on the following principle about test/requirement coverage:* + RAT
		- EN-DC and Standalone
	+ Frequency range
		- FR1 and FR2 separately, i.e. no FR1 and FR2 CA/DC scenario in terms of frequency location of dormant SCells
	+ Single- vs. multiple Cell
		- 1 SpCell triggers dormant BWP switching on 2 SCells
	+ SCS
		- Baseline: one SCS across all cells and BWPs
	+ DCI formats and OFDM symbol position
		- DCI 0-1/1-1 based Case-1/2 and DCI 2-6 based dormancy indication for inside- and outside-active time
			* For inside active time, DCI 1-1 based Case-1 SCell Group dormancy indication
			* For outside active time, DCI 2-6 based SCell Group dormancy indication
		- Dormant BWP switching DCI is after the first 3 OFDM symbols of the slot
	+ Single vs. Separate Tests for BWP switching Latency, Interruption, and Measurement accuracy requirements
		- For interruption at BWP switching and measurement on dormant SCell, both can be verified along with a DCI 1-1 based dormant BWP switching delay requirement test run, i.e. the test can consist of multiple successive time periods to verify each requirement.
 |

Change Requests:

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [R4-2014369](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014369.zip) | MediaTek inc. | «CR on TS38.133 for NR FR1 – NR FR1 Scell dormancy test case in SA» (7.5.3.2) |

## 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: Test case list for Direct SCell activation

*Sub-topic description:*

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

The following test case list was proposed by Ericsson:

* TC1: NR FR1 PCell, direct activation upon addition of known NR FR1 SCell
* TC2: NR FR1 PCell, direct activation upon addition of known NR FR2 SCell
* TC3: NR FR2 PCell, direct activation upon addition of intra-band NR FR2 SCell
* TC4: NR FR1 PCell, direct activation of known NR FR1 SCell upon handover
* TC5: NR FR1 PCell, direct activation of known NR FR2 SCell upon handover
* TC6: NR FR2 PCell, direct activation of intra-band NR FR2 SCell upon handover
* TC7: NR FR1 PCell, direct activation upon RRC Resume of unknown NR FR1 SCell
* TC8: NR FR2 PCell, direct activation upon RRC Resume of intra-band NR FR2 SCell

The following test case list was proposed by Huawei:

* TC1: Direct activation at SCell addition of a single known SCell in FR1 when UE is in EN-DC
* TC2: Direct activation at SCell addition of a single known SCell in FR2 when UE is in EN-DC
* TC3: Direct activation at SCell addition of a single known SCell in FR1 when UE is in NR SA
* TC4: Direct activation at SCell addition of a single known SCell in FR2 when UE is in NR SA

Before deciding the test case list, we need to agree on the test coverage:

* RAT combinations (e.g. EN-DC, SA)
* Frequency range combinations (FR1, FR2, FR1 and FR2)
* Number of SCells to be directly activated in the tests
* Functionality to be tested (direct activation at SCell addition, handover, RRC resume)

**Issue 4-1-1: RAT combinations to be covered**

* Proposals
	+ Option 1 (Huawei): EN-DC and SA
	+ Option 2: (Ericsson): SA
* Recommended WF
	+ Moderator: Collect companies’ views in first round.

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| **Company** | **Comments on issue 4-1-1** |
| Huawei | Support option 1, which is aligned with existing scope of RRM test cases. It is noted that EN-DC UE may not support SA. |
| Ericsson | We are fine with Option 1, and the justification provided by Huawei. |
| Qualcomm | Option 1 because there can be UEs supporting only EN-DC. Can we also further consider applicability rules for UEs supporting both EN-DC and SA? |
| ZTE | Support option 1 |
| Vivo | Support option 1 |
| Nokia | Support option 1 |

**Issue 4-1-2: Frequency range combinations**

* Proposals
	+ Option 1 (Huawei, MediaTek, Qualcomm, ZTE, vivo):
		- FR1 – FR1
		- FR2 – FR2
	+ Option 2: (Ericsson, Nokia):
		- FR1 – FR1
		- FR2 – FR2
		- FR1 – FR2
* Recommended WF
	+ Moderator: Collect companies’ views in first round.

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| **Company** | **Comments on issue 4-1-2** |
| Huawei | Support option 1. On option 2, we understand that in MAC based SCell activation, both FR2-FR2 and FR1-FR2 are tested, but we do not think both need to be repeated for direct activation, as the core requirements on Tactivation are almost same for MAC based activation and direct activation. |
| Ericsson | Support Option 2 as it would test the performance for direct activation of known FR2 cell. For FR2 – FR2 it is a different scenario since here it does not matter whether the FR2 cell is known or unknown since it is FR2 intra-band scenario. On the other hand: this may be the scenario where one would see the issue raised by MediaTek on TCI state activation, so perhaps it would make sense not to define tests for FR1 – FR2 just yet. |
| MTK | We are fine with option 1.  |
| Qualcomm | Option 1. Also agree with Ericsson’s comment about FR1-FR2. |
| ZTE | Option 1 in this meeting. FR1-FR2 test can be further discussed in the next meeting. |
| vivo | Support option 1 |
| Nokia | Support option 2. FR2 is having different conditions. However, if the direct sCell activation is seen well enough tested in FR2 using the FR2-FR2 scenario we might not need the FR1-FR2. But it would depend on the conditions. E.g. in FR1-FR2 we might not have prior knowledge about the SCell spatial settings which may be the case in the FR2-FR2 case (but needs to be discussed). |

**Issue 4-1-3: Number of SCells to be directly activated**

* Proposals
	+ Option 1 (Ericsson, Huawei): Direct activation of single SCell
* Recommended WF
	+ Moderator: Can we agree on Option 1?

|  |  |
| --- | --- |
| **Company** | **Comments on issue 4-1-3** |
| Huawei | We support option 1. |
| Ericsson | Support Option 1. |
| MTK | Support option 1. |
| Qualcomm | Support Option 1. |
| ZTE | Option 1 is fine. |
| Nokia | We are fine with 1 SCell. Option 1. |

**Issue 4-1-4: Functionality to be tested**

* Proposals
	+ Option 1 (Huawei): Direct activation upon SCell addition
	+ Option 2 (Ericsson): Direct activation upon SCell addition, and handover~~, and RRC resume~~
* Recommended WF
	+ Moderator: Collect companies’ views in first round.

*The topic was handled at the GTW session 2020-11-04, with the following outcome:*

Agreement: Direct activation upon SCell addition, handover

|  |  |
| --- | --- |
| **Company** | **Comments on issue 4-1-4** |
| Huawei | Support option 1. Since the core requirements on Tactivation are almost same for different functionaries, it should be enough to pick up one of them for testing as RAN4 tests should focus on performance but not functionality. It is also noted that in LTE we only have direct SCell activation test for SCell addition case. |
| Ericsson | Support a modified Option 2 with SCell addition and handover; RRC resume we can skip. In E-UTRA, two cases are tested: handover (36.133 A.5.1.39, A.5.1.40) and SCell addition (36.133 A.8.16.106). We think we should have at least the same coverage w.r.t. functionality in the NR tests. |
| MTK | Agree to specify test cases that already existed in LTE. |
| Qualcomm | Support Option 1. |
| ZTE | In addition to SCell addition, we think the tests with handover should also be specified. |
| Nokia | Handled in GTW and we’re fine with the GTW agreement |

### Sub-topic 4-2: Test case list for SCell dormancy

Concrete test case lists have been proposed by some companies, to varying levels of details, whereas other companies have provided more top level view on the test coverage as such.

The following test case list was proposed by Huawei:

SCell dormancy switching delay:

* TC1: EN-DC, single SCell in FR1, DCI 0\_1/1\_1 within first 3 OFDM symbol
* TC2: EN-DC, multiple SCells in FR1, DCI 2\_6 within first 3 OFDM symbol
* TC3: EN-DC, single SCell in FR2, DCI 0\_1/1\_1 after first 3 OFDM symbol
* TC4: NR SA, multiple SCells in FR1, DCI 0\_1/1\_1 after first 3 OFDM symbol
* TC5: NR SA, multiple SCells in FR2, DCI 2\_6 after first 3 OFDM symbol
* TC6: NR SA, single SCell in FR2, DCI 0\_1/1\_1 within first 3 OFDM symbol

RRM/CSI measurement during SCell dormancy:

* TC1: EN-DC and SCell in FR1
* TC2: EN-DC and SCell in FR2
* TC3: NR SA and SCell in FR1
* TC4: NR SA and SCell in FR2

The following test case list was proposed by Ericsson:

SCell dormancy switching delay, interruptions, and measurements during SCell dormancy:

* TC1: NR FR1 PCell, dormancy switching of single NR FR1 SCell
* TC2: NR FR1 PCell, dormancy switching of multiple NR FR1 SCells
* TC3: NR FR2 PCell, dormancy switching of single NR FR2 SCell
* TC4: NR FR1 PCell, dormancy switching of NR FR1 SCell and NR FR2 SCell
* TC5: NR FR2 PCell, dormancy switching of multiple NR FR2 SCells

The following test case list was proposed by MediaTek:

SCell dormancy switching delay for to and from dormancy:

* TC1: EN-DC mode: E-UTRAN - NR PSCell FR1 with FR1 SCell
* TC2: EN-DC mode: E-UTRAN - NR PSCell FR2 with FR2 SCell
* TC3: SA mode: NR FR1 – NR FR1
* TC4: SA mode: NR FR2 – NR FR2
* TC5: SA mode: NR FR1 – NR FR2

The following high-level proposal on test coverage was provided by Qualcomm:

RAN4 to define performance test cases for dormant SCell requirements based on the following principle about test/requirement coverage:

* RAT
	+ EN-DC and Standalone
* Frequency range
	+ FR1 and FR2 separately, i.e. no FR1 and FR2 CA/DC scenario in terms of frequency location of dormant SCells
* Single- vs. multiple Cell
	+ 1 SpCell triggers dormant BWP switching on 2 SCells
* SCS
	+ Baseline: one SCS across all cells and BWPs
* DCI formats and OFDM symbol position
	+ DCI 0-1/1-1 based Case-1/2 and DCI 2-6 based dormancy indication for inside- and outside-active time
		- For inside active time, DCI 1-1 based Case-1 SCell Group dormancy indication
		- For outside active time, DCI 2-6 based SCell Group dormancy indication
	+ Dormant BWP switching DCI is after the first 3 OFDM symbols of the slot
* Single vs. Separate Tests for BWP switching Latency, Interruption, and Measurement accuracy requirements

Hence before deciding on a test case list, we need to agree on the test coverage:

* RAT combinations (e.g. EN-DC, SA)
* Frequency range combinations (FR1, FR2, FR1 and FR2)
* Number of SCells to be tested
* SCS configuration(s)
* DCI formats and triggering occasions
* How many requirements to test in each test case

**Issue 4-2-1: RAT combinations to be covered**

* Proposals
	+ Option 1 (Qualcomm, Huawei, MediaTek): EN-DC and SA
	+ Option 2: (Ericsson): SA
* Recommended WF
	+ Moderator: Collect companies’ views in first round.

|  |  |
| --- | --- |
| **Company** | **Comments on issue 4-2-1** |
| Huawei | Support option 1, which is aligned with existing scope of RRM test cases. It is noted that EN-DC UE may not support SA. |
| Ericsson | We are fine with Option 1. |
| MTK | Support option 1 |
| Qualcomm | Support Option 1. Can there be test applicability rules for UEs supporting both EN-DC and SA, if identified? |
| ZTE | Support option 1 |
| vivo | Support option 1 |
| Nokia | Option 1 is fine |

**Issue 4-2-2: Frequency range combinations to be covered (SpCell – SCell)**

* Proposals
	+ Option 1 (Qualcomm):
		- FR1 – FR1
		- FR2 – FR2
	+ Option 2 (Ericsson, MediaTek):
		- FR1 – FR1
		- FR2 – FR2
		- FR1 – FR2
* Recommended WF
	+ Moderator: Collect companies’ views in first round.

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| **Company** | **Comments on issue 4-2-2** |
| Huawei | We support option 2 considering FR1-FR2 is also a typical use case for dormancy. We understand option 1 is for SCell-SCell, but not for SpCell – SCell, but maybe QC can please clarify. |
| Ericsson | We support Option 2. |
| MTK | We can also agree option 1  |
| Qualcomm | To Huawei’s question, “yes, we meant two dormant SCells”. For SpCell – SCell, we can support Option 2. |
| ZTE | Option 2 is preferable. However, it seems there would be test feasibility issues for FR1-FR2 case. |
| Nokia | Support option 2. |

**Issue 4-2-3: Number of SCells in SCell dormancy tests**

* Proposals
	+ Option 1a (Qualcomm): 1 SpCell triggers dormant BWP switching on 2 SCells
	+ Option 1b (Ericsson, Huawei): 1 SpCell triggers dormant BWP switching on 1 or 2 SCells depending on test case.
	+ Option 2 (MediaTek): Only define test cases where 1 SpCell triggers dormant BWP switching on single SCell (due to outstanding issue on HARQ-ACK transmission)
	+ Option 3 (MediaTek): For now, define test cases where 1 SpCell triggers dormant BWP switching on single SCell (due to outstanding issue on HARQ-ACK transmission). Await RAN1 feedback before deciding whether to cover also cases where 1 SpCell is triggering multiple SCells.
* Recommended WF
	+ Moderator: Regarding Option 3 and the issue with HARQ feedback, my understanding is that this issue mainly arises when the number of SCells for which dormancy switching is triggered is large. Hence a question to proponents of Option 3: Would this problem arise if narrowing down to dormancy switching on only 2 SCells? If it does not, can we consider any of Options 1a/1b and remove Options 2/3?

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| --- | --- |
| **Company** | **Comments on issue 4-2-3** |
| Huawei | Support option 1b which gives best test coverage. |
| Ericsson | We support Option 1b. |
| Qualcomm | Can support Option 1b on an understanding that Option 1a is a sub-set of Option 1b and RAN4 will further discuss what exact test cases will be for 1 or 2 Scells. |
| ZTE | Support Option 1b |
| Nokia | We are fine with option 1b |

**Issue 4-2-4: SCS configurations**

* Proposal
	+ Option 1: One SCS across all cells and BWPs within a FR as baseline
* Recommended WF
	+ Moderator: Can we agree on Option 1?

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| --- | --- |
| **Company** | **Comments on issue 4-2-4** |
| MTK | Support option 1. |
| Huawei | Support option 1. |
| Ericsson | We support Option 1. |
| Qualcomm | Support Option 1. |
| ZTE | Fine with Option 1. |
| vivo | Support option 1 |
| Nokia | option 1 is fine |

**Issue 4-2-5: DCI formats and triggering occasion**

* Proposals
	+ Option 1 (Qualcomm, MediaTek, vivo):
		- DCI 0-1/1-1 based Case-1/2 and DCI 2-6 based dormancy indication for inside- and outside-active time
			* For inside active time, DCI 1-1 based Case-1 SCell Group dormancy indication
			* For outside active time, DCI 2-6 based Scell Group dormancy indication
		- Dormant BWP switching DCI is after the first 3 OFDM symbols of the slot
	+ Option 2 (Huawei, Ericsson, ZTE):
		- DCI 0\_1/1\_1 within first 3 OFDM symbols in a slot
		- DCI 0\_1/1\_1 after first 3 OFDM symbols in a slot
		- DCI 2\_6 within the first 3 OFDM symbols in a slot
		- DCI 2\_6 after the first 3 OFDM symbols in a slot
* Recommended WF
	+ Moderator: Collect companies’ views in first round.

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| --- | --- |
| **Company** | **Comments on issue 4-2-5** |
| Huawei | Support option 2.It is noted that supporting of DCI after first 3 symbols is an optional UE capability, so we should not define all test cases with this setup. For inside active time, we are open to discuss whether it should be based on Case-1 or Case-2. |
| Ericsson | We are fine with Option 2. |
| MTK | Support option 1.  |
| Qualcomm | Support Option 1. “DCI after 3 OFDM symbols” doesn’t need to be separately tested at least from latency requirement perspective. |
| ZTE | Option 2. For DCI 2-6 we also need to consider both cases of inside active time and outside active time. |
| vivo | Fine with option 1 |

**Issue 4-2-6: Testing of multiple requirements in single test case or multiple test cases**

* Proposals
	+ Option 1 (): Testing of BWP switching latency, Interruption, and Measurement accuracy requirements can be covered in the same test case.
	+ Option 2 (): Testing of BWP switching latency and testing of interruption are in separate test cases.
	+ Option 3 (Ericsson, Huawei, Qualcomm): Testing of BWP switching latency and interruption (at switching and at measurements on dormant cell) requirements can be covered in the same test case.
* Recommended WF
	+ Moderator: Collect companies’ views in first round.

|  |  |
| --- | --- |
| **Company** | **Comments on issue 4-2-6** |
| Huawei | We agree that delay and interruption for dormancy switching can be verified in a single test case. The question is more about interruption requirements for measurement during dormancy, and we are open to discuss if it can be tested in the same test case with dormancy switching. On option 1, could proponent please clarify why we need to define Measurement accuracy requirements test? In our view, it is the interruption requirements that need to be verified. |
| Ericsson | We agree with Huawei on that measurement accuracy testing shall not be part of it. In fact there were three different proposals but it was incorrectly captured as just two.I take it as Huawei would be fine with testing latency and interruptions in the same test cases. Moderator can add related missing option. |
| Moderator | Adding Option 3 according to Huawei’s and Ericsson’s comments above. Indicating support of Option 3 by Ericsson and Huawei. |
| MTK | Support option 3 |
| Qualcomm | What we meant to propose was “interruption” upon measurement on dormant Scell(s). Does “interruption” in Option 3 include “interruption” due to both “BWP switching” and “measurement”? If yes, we support Option 3. |
| ZTE | Option 3 is reasonable. |
| vivo | We support option 3 |
| Nokia | We support option 3 |

### Sub-topic 4-3: Time plan for performance part

**Issue 4-3-1: Time plan for development of MR-DC test cases**

* Proposals
	+ Option 1 (Ericsson): Time plan for developing MR-DC test cases:
		- RAN4#97-e (November 2020):
			* Agree on high-level list for test cases.
			* Agree on work split between interested companies.
		- RAN4#98-e (January 2021):
			* Provide draft CRs for test cases.
			* Provide big CR by bundling draft CRs.
		- ~~RAN4#98bis-e (April 2021):~~
			* ~~Provide final CRs for test cases.~~
* Recommended WF
	+ Moderator: Can we agree on Option 1?

*The topic was discussed at the GTW session 2020-11-04. It was pointed out by vice chair that according to 3GPP procedures the work plan has to follow the WI schedule. According to the WI schedule, RAN4 work shall be completed by RP#91-e in March 2021. The ambition therefore is to provide a big CR with test cases during RAN4#98-e. There is an understanding that in normal times, the 6 month period for performance work comprises three RAN4 meetings, whereas in the current time, the same period comprises only two RAN4 meetings. Rapporteur indicated that if needed, extension by one quarter can be requested at RP#91-e.*

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| **Company** | **Comments on issue 4-3-1** |
| Huawei | We are in principle fine with option 1, but it means the completion of the Perf part (June 21) is 9 months after Core part completion (Sept 20), and this extension needs to be discussed in RAN. |
| Ericsson | We support the proposal and will, if it is agreeable to the RAN4 group, bring it up at RAN plenary in capacity of Rapporteurs.We agree with Huawei’s observation on that we see one extra quarter delay, but this is mainly an unfortunate consequence of modified meeting schedule due to the pandemic. We still need three RAN4 meetings for performance part. |
| MTK | OK for option 1. Whether to extend the time line depends on RAN plenary’s decision. |
| Qualcomm | Option 1. |
| ZTE | The plan need to be made based on WI schedule. Not clear if the WI can be further extended which will be decided in the RANP meeting. The work plan can be revised in the next meeting if there is agreement in the RANP meeting. |
| vivo | Fine with option 1. |
| Nokia | Discussed during the GTW. |

## Companies views’ collection for 1st round

### CRs/TPs comments collection

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| R4-2014369 | «CR on TS38.133 for NR FR1 – NR FR1 Scell dormancy test case in SA», MediaTek |
| 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 #4-1** | **Issue 4-1-1: RAT combinations to be covered**All six companies that commented are supporting the following:[Test cases for Direct Scell activation are to be defined for] EN-DC and SAOne company proposed that RAN4 can further discuss whether an applicability rule that would limit the testing in case UE supports both EN-DC and SA can be introduced. The proposal will be added as a new issue for second round.Agreement is to be captured in WF on test cases. |
| **Issue 4-1-2: Frequency range combinations**Seven companies commented on which frequency range combinations to support in test cases for Direct SCell activation. Five of the companies are supporting Option 1 where spCell and SCell are in the same FRs, and two companies are supporting Option 2 where also the case spCell in FR1 and SCell in FR2 is supported.*Candidate options:** Option 1 (Huawei, MediaTek, Qualcomm, ZTE, vivo):
	+ FR1 – FR1
	+ FR2 – FR2
* Option 2: (Ericsson, Nokia):
	+ FR1 – FR1
	+ FR2 – FR2
	+ FR1 – FR2

*Recommendations for 2nd round:** Continue discussions during second round. The issue is also related to Issue 1-1-2.
* Continue in parallel with test case list definition based on Option 1, as Option 1 represents a subset of Option 2.
* In case final agreement is Option 2, add corresponding tests to test case list, either at this or at a future meeting.

Agreement is to be captured in WF on test cases. |
| **Issue 4-1-3: Number of SCells to be directly activated**All six companies that commented are supporting the following:[Test cases are based on] Direct activation of single SCell Agreement is to be captured in WF on test cases. |
| **Issue 4-1-4: Functionality to be tested**The topic was handled at the GTW session 2020-11-04, with the following outcome:[Test cases are to cover] Direct activation upon SCell addition, and upon handoverAgreement is to be captured in WF on test cases. |
| **Sub-topic #4-2** | **Issue 4-2-1: RAT combinations to be covered**All seven companies that commented are supporting the following:[Test cases for SCell dormancy are to be defined for] EN-DC and SAAgreement is to be captured in WF on test cases. |
| **Issue 4-2-2: Frequency range combinations to be covered (SpCell – SCell)**All six companies commenting are supporting the following:[SCell dormancy test cases are to be defined for the following FR combinations]* FR1 – FR1
* FR2 – FR2
* FR1 – FR2

Agreement is to be captured in WF on test cases. |
| **Issue 4-2-3: Number of SCells in SCell dormancy tests**All five companies commenting are supporting the following:[In SCell dormancy tests] 1 SpCell triggers dormant BWP switching on 1 or 2 SCells depending on test case.Agreement is to be captured in WF on test cases. |
| **Issue 4-2-4: SCS configurations**All seven companies commenting are supporting the following:[SCell dormancy tests will use] one SCS across all cells and BWPs within a FR as baselineAgreement is to be captured in WF on test cases. |
| **Issue 4-2-5: DCI formats and triggering occasion**Six companies commented on proposals on DCI formats and triggering occasions to be used in test cases. Three companies are supporting each of Option 1 and Option 2.*Candidate options:** Option 1 (Qualcomm, MediaTek, vivo):
	+ DCI 0-1/1-1 based Case-1/2 and DCI 2-6 based dormancy indication for inside- and outside-active time
		- For inside active time, DCI 1-1 based Case-1 SCell Group dormancy indication
		- For outside active time, DCI 2-6 based Scell Group dormancy indication
	+ Dormant BWP switching DCI is after the first 3 OFDM symbols of the slot
* Option 2 (Huawei, Ericsson, ZTE):
	+ DCI 0\_1/1\_1 within first 3 OFDM symbols in a slot
	+ DCI 0\_1/1\_1 after first 3 OFDM symbols in a slot
	+ DCI 2\_6 within the first 3 OFDM symbols in a slot
	+ DCI 2\_6 after the first 3 OFDM symbols in a slot

*Recommendations for 2nd round:** Continue discussions during second round.
* Continue in parallel with test case list definition based on Option 2.
* In case final agreement is Option 1, remove corresponding test cases from test case list as Option 1 represents a subset of Option 2.

Agreement is to be captured in WF on test cases. |
| **Issue 4-2-6: Testing of multiple requirements in single test case or multiple test cases**All eight companies commenting are supporting the following:Testing of BWP switching latency and interruption (at switching and at measurements on dormant cell) requirements can be covered in the same test case.Agreement is to be captured in WF on test cases. |
| **Sub-topic #4-3** | **Issue 4-3-1: Time plan for development of MR-DC test cases**The topic was handled at the GTW session 2020-11-04. There was no opposition against adjusting the proposed time plan to make it compliant with the WI schedule. Hence th following can be captured as an agreement: Time plan for developing MR-DC test cases:* + - RAN4#97-e (November 2020):
			* Agree on high-level list for test cases.
			* Agree on work split between interested companies.
		- RAN4#98-e (January 2021):
			* Provide draft CRs for test cases.
			* Provide big CR by bundling draft CRs.

Agreement is to be captured in WF on test cases. |

*Suggestion on WF/LS assignment*

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| --- | --- | --- |
|  | **WF/LS t-doc Title**  | **Assigned Company,****WF or LS lead** |
| #1 | Way Forward on Test Cases for Direct SCell Activation and SCell Dormancy | Ericsson |

### 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**  |
| R4-2014369 | «CR on TS38.133 for NR FR1 – NR FR1 Scell dormancy test case in SA», MediaTek***Return to*** *as test case list has not yet been agreed.* |

## Discussion on 2nd round (if applicable)

**Issue 4-1-2: Frequency range combinations**

Seven companies commented on which frequency range combinations to support in test cases for Direct SCell activation. Five of the companies are supporting Option 1 where spCell and SCell are in the same FRs, and two companies are supporting Option 2 where also the case spCell in FR1 and SCell in FR2 is supported.

*Candidate options:*

* Option 1 (Huawei, MediaTek, Qualcomm, ZTE, vivo):
	+ FR1 – FR1
	+ FR2 – FR2
* Option 2: (Ericsson, Nokia):
	+ FR1 – FR1
	+ FR2 – FR2
	+ FR1 – FR2

*Recommendations for 2nd round:*

* Continue discussions during second round. The issue is also related to Issue 1-1-2.
* Continue in parallel with test case list definition based on Option 1, as Option 1 represents a subset of Option 2.
* In case final agreement is Option 2, add corresponding tests to test case list, either at this or at a future meeting.

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| **Company** | **Comments in 2nd round on issue 4-1-2** |
| Apple | Support option 1. |
| Qualcomm | Support Option 1. We do want to avoid test cases that are expected to be less prevalent. |
| Huawei | Support option 1. The activation delay mainly depends on the SCell to be activated but not the serving cell, so we do not see particular need for FR1-FR2. |
| Ericsson | We can compromise to Option 1. If needed, further test cases can be introduced in future release. |
| Nokia | We still support option 2. We understand the view of trying to limit the number of TCs. But the FR1-FR2 case scenario is different than the currently described FR2-FR2 case. Our understanding is that the base assumption still is that UE receives with one spatial setting (one Rx) and not multipanel IBM capable UE. Hence, the FR2-FR2 case does not represent the same scenario as FR1.FR2 as in this latter case the FR2 spatial settings on UE side and the delay is also part of the overall delay and test. |

**Issue 4-1-5: Direct SCell activation test applicability rule for UE supporting both EN-DC and SA (NEW)**

During first round, one company made a proposal on introducing test applicability rules such that a UE that is supporting both EN-DC and SA does not have to go through the same Direct SCell activation test case for both EN-DC and SA modes of operation.

*Candidate options:*

* Option 1 (Qualcomm): A UE that supports both EN-DC and SA shall have to pass a test only for EN-DC or SA mode of operation, not both.
* Option 2: A UE that supports both EN-DC and SA shall pass a test for both EN-DC and SA modes of operation.

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| **Company** | **Comments in 2nd round on issue 4-1-5** |
| Apple | Actually we already have a general testing principle in A.3.13 since R15. Option 1 is in line with existing testing principle. |
| Qualcomm | Share the same view as Apple. |
| Huawei | Share the same view as Apple/QC. |
| Ericsson | We support Option 1 and the existing testing principle. |
| Moderator | With Option 1 being aligned with existing testing principle, we can close this issue. UE that supports both EN-DC and SA only has to pass test case for one of the modes of operation. |
| Nokia | Based on this we can support option 1 |

**Issue 4-2-5: DCI formats and triggering occasion**

Six companies commented on proposals on DCI formats and triggering occasions to be used in test cases. Three companies are supporting each of Option 1 and Option 2.

*Candidate options:*

* Option 1 (Qualcomm, MediaTek, vivo):
	+ DCI 0-1/1-1 based Case-1/2 and DCI 2-6 based dormancy indication for inside- and outside-active time
		- For inside active time, DCI 1-1 based Case-1 SCell Group dormancy indication
		- For outside active time, DCI 2-6 based Scell Group dormancy indication
	+ Dormant BWP switching DCI is after the first 3 OFDM symbols of the slot
* Option 2 (Huawei, Ericsson, ZTE):
	+ DCI 0\_1/1\_1 within first 3 OFDM symbols in a slot
	+ DCI 0\_1/1\_1 after first 3 OFDM symbols in a slot
	+ DCI 2\_6 within the first 3 OFDM symbols in a slot
	+ DCI 2\_6 after the first 3 OFDM symbols in a slot

*Recommendations for 2nd round:*

* Continue discussions during second round.
* Continue in parallel with test case list definition based on Option 2.
* In case final agreement is Option 1, remove corresponding test cases from test case list as Option 1 represents a subset of Option 2.

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| **Company** | **Comments in 2nd round on issue 4-2-5** |
| Qualcomm | Option 1. And for DCI position w.r.t slot, we are okay to with (1) DCI within always the first 3 OFDM symbols or (2) DCI within/after the first 3 OFDM symbols depending on UE capability. In terms of Case-1 vs. Case-2 DCI, Case-2 has more restrictions on the maximum number of Dormant SCells that can be indicated by the Case-2 DCI for simultaneous BWP switching due to corresponding RAN1 HARQ-ACK timeline. Thus, we prefer to use Case-1 scheduling DCI. |
| Huawei | On DCI location within slot, we still prefer option 1, i.e. to have both. On the other hand, we do not see the need to duplicate the test case just for DCI within or after the first 3 OFDM symbols.On the Case-1 vs. Case-2, we do have strong view. |
|  |  |

**Issue 4-2-7: SCell dormancy test applicability rule for UE supporting both EN-DC and SA (NEW)**

During first round, one company made a proposal on introducing test applicability rules such that a UE that is supporting both EN-DC and SA does not have to go through the same SCell dormancy test case for both EN-DC and SA modes of operation.

*Candidate options:*

* Option 1 (Qualcomm): A UE that supports both EN-DC and SA shall have to pass a test only for EN-DC or SA mode of operation, not both.
* Option 2: A UE that supports both EN-DC and SA shall pass a test for both EN-DC and SA modes of operation.

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| **Company** | **Comments in 2nd round on issue 4-2-7** |
| Apple | Actually we already have a general testing principle in A.3.13 since R15. Option 1 is in line with existing testing principle. |
| Qualcomm | Share the same view as Apple. |
| Huawei | Share the same view as Apple/QC. |
| Ericsson | We support Option 1 and the existing testing principle. |
| Moderator | With Option 1 being aligned with existing testing principle, we can close this issue. UE that supports both EN-DC and SA only has to pass test case for one of the modes of operation. |
| Nokia  | Same view as for Issue 4-1-5 |

### CRs/TPs comments collection 2nd round

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| --- | --- |
| **CR/TP number** | **Comments collection** |
| R4-2014369 | «CR on TS38.133 for NR FR1 – NR FR1 Scell dormancy test case in SA», MediaTek |
| Company A |
| Company B |
| R4-2017130 | «WF on Test Cases for Direct SCell Activation and SCell Dormancy», Ericsson |
| 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*

|  |  |
| --- | --- |
| **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”* |