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

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

**Agenda item:** 7.13

**Source:** Moderator (Intel Corporation)

**Title:** Email discussion summary for[97e][218] NR\_RRM\_Enh\_RRM\_Part\_1

**Document for:** Information

# Introduction

The email discussion is intended to cover topics in AI 7.13.1.3 (BWP switching on multiple CCs), AI 7.13.1.4 (UL spatial relation info switching) in RRM enhancement core part and AI 7.13.2.1 (General), AI 7.13.2.24 (BWP switching on multiple CCs) and AI 7.13.2.24 (UL spatial relation info switching) in RRM performance part.

# Topic #1: BWP Switching on multiple CCs in core part

## Companies’ contributions summary

*Moderator note: R4-2015304, R4-2016427, R4-2015306, R4-2015305, R4-2016428 are related to cross-carrier BWP switching and will be treated in the email thread [211] instead of [218].*

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| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2014570**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014570.zip) | Intel | ***Proposal 1: Simultaneous RRC based BWP switch can’t be applied for case 1. Clarify if case 2 can be applied simultaneously.***  ***Proposal 2: If both case 1 and case 2 can’t be applied simultaneously, the delay requirement about simultaneous RRC based BWP switch on multiple CCs will be removed.***  ***Proposal 3: Further discuss whether new delay requirement needs to be defined for case 1 and case 2.*** |
| [**R4-2014773**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014773.zip) | MediaTek inc. | ***Proposal 1: There is no RRC-based simultaneous BWP switch for multiple CCs.***  ***Proposal 2: There is only PCell + PSCell for RRC-based partially overlapped BWP switch.*** |
| [**R4-2016165**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2016165.zip) | Ericsson | * **Observation 1:** Number of CCs in different cell groups can be the same or they can be different in different CGs for RRC based non-simultaneous BWP switching on multiple CCs. But the current requirement in 8.6.3A.2 does not reflect this notion. * **Proposal 1:** Clarify that N and M are the number of CCs in the first CG and in the second CG respectively for RRC based non-simultaneous BWP switching on multiple CCs. |

## Open issues summary and companies view’s collection

### Open issues and comments collection

**Issue 1-1-1: Scenario for simultaneous RRC based BWP switch on multiple CCs**

*Moderator note: Encourage companies to discuss the scenario of RRC-based simultaneous BWP switch on multiple CCs. The issue will depend on conclusion of RRC-based BWP switch on single SCell in Rel-15 as well, which will be discussed in agenda 4.7. If no applied scenarios are found, the delay requirement about simultaneous RRC based BWP switch on multiple CCs will be removed.*

* Option 1 (Intel):
  + Simultaneous RRC based BWP switch can’t be applied for case 1. Clarify if case 2 can be applied simultaneously.
  + If both case 1 and case 2 can’t be applied simultaneously, the delay requirement about simultaneous RRC based BWP switch on multiple CCs will be removed.
  + Further discuss whether new delay requirement needs to be defined for case 1 and case 2.
* Option 2 (MTK):
  + There is no RRC-based simultaneous BWP switch for multiple CCs.
  + There is only PCell + PSCell for RRC-based partially overlapped BWP switch.
* Recommended WF:
  + Further discussion.

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| **Company** | **Comments** |
| Huawei | We have related contribution (R4-2015529) for Rel-15 maintenance about the applicable for RRC-based BWP switch for SCell. We agree that the BWP switch via changing the firstactivebwpID is only applicable for sPCell. But it is feasible to change parameters of the active BWP without changing the active BWP ID for an SCell. So the simultaneous BWP switch on multiple CCs triggered by RRC is feasible when only the parameters of the same active BWP is changes for the involved the SCells. |
| Ericsson | We understand that the RRC signalling cannot trigger simultaneous bandwidth part switching on SCell(s) by changing the active BWP ID. But the BWP switching can also be triggered by changing any other BWP related parameters. This should be possible for any serving cell (including SCells). Therefore RRC-based simultaneous BWP switching if possible should be kept. |
| MTK | We have different understanding on whether to define a RRC-based BWP switch for SCell.  In RAN2, the original purpose on introducing RRC-based BWP switch is to support switching from initial BWP to first active BWP. So the signalling ***firstActiveDownlinkBWP-Id*** is introduced.  RAN2 also had some discussions on whether to introducing RRC-based SCell BWP switch. The reason on not supporting SCell BWP switch is NW can directly deactivate the SCell other than switch SCell to a smaller BW part for power saving.  We think RAN4 has an over explanation on RRC-based BWP switching. If there is no consensus in RAN4, we also support to send LS to RAN2 for further clarification. |
| vivo | We share similar view with MTK. It is feasible that BWP switch on scell is changed without changing the BWP ID however we think this is not a general case. |
| Apple | RRC based BWP switch is with RRC re-configuration for ***firstActiveDownlinkBWP-Id*** based on our understanding of RAN2 spec. As MTK suggested seems like RAN4 is extending the possibility of RRC based switch beyond RAN2’s definition. We support sending LS to RAN2 to further clarify.  ---11/4---  To Nokia: We are discussing BWP switch on multiple CCs based on Rel-15 BWP switch. We should not mix Rel-16 enhancement with direct SCell activation here. Then we open the door for many such discussions which is not in the scope of this WI. |
| Qualcomm | We agree with observations from companies. |
| NEC | Similar comments as RRC based BWP switching in agenda item 4.7. We share similar understanding as Huawei and Ericsson. Hence RRC-based simultaneous BWP switching is feasible for SCells also and should not be limited to PCell and PSCell. |
| Intel | From RAN2 spec, in case of SCell, the UE switch to firstActiveDownlinkBWP-id upon activation of an SCell.   * If the status of SCell is deactivated, the UE switches firstActiveDownlinkBWP-id when the UE receives activation of the SCell. * If Scell is in activated status when SCell is modified with new firstActiveDownlinkBWP-Id, the UE will switch to firstActiveDownlinkBWP-Id upon ‘next’ SCell activation after this SCell is deactivated. SCell can’t do BWP switch in active state.   from our understanding, RRC based BWP switch for SCell is more like a configuration command than a switching command.  we agree with sending LS to RAN2 to clarify the scenario of RRC based BWP switch for SCell first. |
| ZTE | From RAN4 perspective, we see the benefit to have RRC based BWP switching be applicable for SCell either that BWP switch delay can be reduced. So if RAN4 can reach agreements on this part then we can send LS to RAN2 and let RAN2 know the merit of having such mechanism. |
| Nokia | In R16, we have direct Scell activation by RRC, hence RRC-based BWP switch could be performed for all cells. Therefore, Current simultaneous RRC-based BWP switch for multiple CCs is valid. |

**Issue 1-1-2: Clarification for Non-simultaneous RRC based BWP switch on multiple CCs**

* Option 1(Ericsson):
  + Clarify that N and M are the number of CCs in the first CG and in the second CG respectively for RRC based non-simultaneous BWP switching on multiple CCs.
* Recommended WF:
  + Agree with option 1.

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| **Company** | **Comments** |
| Huawei | We have similar change to remove the reference to the simultaneous section about the definition of N. We agree that it is more clear to use different variable to indicate the number of CCs in different CGs. |
| Ericsson | We support the recommended way forward. |
| MTK | Agree with option 1. |
| vivo | Agree with option 1. |
| Apple | Unless there is a conclusion on whether RRC based simultaneous BWP switch on multiple CCs is supported, the current requirements for partial overlap RRC based switch should be for single CC in each CG. |
| Qualcomm | Agree with Option 1. |
| NEC | Agree with option 1 |
| Intel | Agree with the recommended way forward. |
| ZTE | Okay with option 1. |
| Nokia | Agree with the recommended WF |

**Issue 1-1-3: Whether to define new UE capability- Parallel processing of BWP switching in different frequency ranges**

*Moderator note: Based on the guidance from chairmen, there was a GTW discussion in the Main session on the Rel-16 UE feature list and some topics were agreed to be further treated in the RRM session. Among them, Issue 6-2: feature 9-11 => will be handled in email thread [218]. Due to late announcement, comments can be collected in the first round and the decisions can be made in GTW or in the 2nd round.*

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| [9-11] | [Parallel processing of BWP switching in different frequency ranges] | Support of processing BWP switching, in parallel, across FR1 and FR2 | RAN4 3-1 | Yes | N/A | Network cannot know whether UE is capable of processing BWP switching, in parallel, in FR1 and FR2. | Per UE | No | No | N/A | RAN4 agreement:  Delay requirements for DCI/timer based BWP switch = ;  If UE is capable of this feature; then N is the # of simultaneous BWP switching in the same FR.  If UE is not capable; then N is the # of simultaneous BWP switching in FR1 and FR2. | Optional with capability signaling |

* Option 1:
  + Remove the feature
* Option 2:
  + Keep the feature
* Recommended WF:
  + Further discussion.

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| **Company** | **Comments** |
| vivo | Our initial preference is to remove this feature. |
| Apple | Option 1. We prefer to remove this feature. |
| Qualcomm | Option 2. Depending on UE implementation UE may or may not be able to support parallel BWP switching across FR1 and FR2. |
| Intel | Option 1. We prefer to remove this feature. We already have UE per-FR gap capability to differentiate whether parallel processing can be applied for different FR. |
| MTK | Option 1.  We have the same view with Intel. The spec. is clear and the agreement was achieved in last meeting. When UE reports to support per-FR gap, UE will support parallel BWP switching. |
| ZTE | If per-FR gap can be used as indication of parallel BWP switch processing, then we don’t need this new UE capability. |
| Ericsson | We are OK with Option 2, unless there is consensus on that per-FR/per-UE gap capability can indicate the same. |
| Nokia | We prefer to remove this feature 9-11 from feature list. |
| Huawei | We prefer option 1. |

### CRs/TPs comments collection

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| **CR/TP number** | **Comments collection** |
| [**R4-2014774**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014774.zip) MediaTek inc. | Huawei: This CR depends on the conclusion of issue 1-1-1. |
| Ericsson: RAN4 should first agree on way forward how to address RRC based BWP switching for SCells. See our comments on issue 1-1-1. |
| vivo: depends on discussion of issue 1-1-1. |
| Apple: Depends on Issue 1-1-1.  On a general note, we are not allowed to re-name sections. In case we agree that RRC based simultaneous BWP switch requirements are not defined, then we should void the section and not re-name or re-use it. |
| Intel: Discuss issue 1-1-1 before making decision. |
| Nokia: CR should come back when the issue 1-1-1 has conclusion. |
| [**R4-2014837**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014837.zip) vivo | Huawei: We prefer not to remove the clarification of SCS. The SCS ambiguity results from not only the SCS difference among multiple CCs but also the SCS changes caused by the BWP switch. The removed part reflects the second cases. |
| Ericsson: OK. May have to be aligned with related CRs on SCell dormancy and cross carrier scheduling of active BWP switching (e-mail thread 211). |
| vivo: To our understanding, RAN4 firstly agree on which SCS will be used for the scenario where SCS is changed before and after BWP switch. Then RAN4 find that conclusion does not include all cases and further agreed that SCS is based on all involved CCs, even there is no SCS change after BWP change on a particular CC.  We think the later agreement includes all scenario hence remove “” will make specs more clear. |
| Apple: It is important to have the clarification on SCS otherwise there is a lot of ambiguity on the delay. For single CC switch we already have clarification that its based on the smaller SCS before and after switch.  It’s fine to introduce a table to capture D, but the candidate values should be in “{}” |
| Qualcomm: Pending issue in SCell dormancy discussion. And for this, N doesn’t seem to include scheduling Cell.  ~~~~~ CR copy ~~~~  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 defined by N before and after BWP switch. |
| Intel: prefer to not remove the clarification. Since the second part reflects the case where BWP switch involves SCS changes. |
| Nokia: The change of SCS clarification in the CR will cause a little different understanding on the specification. we prefer to keep current specification. The D value has been defined in UE capability bwp-SwitchingMultiCCs-r16, no need to introduce the same here. |
| [**R4-2015504**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2015504.zip)  Huawei, HiSilicon | Ericsson: Shall be handled in e-mail thread 211. Cross carrier scheduling is not within the scope of NR\_RRM\_enh. |
| MTK: Agree with E///. It shall be handled in 211. |
| vivo: same comments as Eric and MTK |
| Intel: for changing definition of N for non-simultaneous RRC based BWP switch, suggest to align with CR from Ericsson(R4-2016166).  For cross-carrier scheduling part, will be handled in thread 211. |
| Nokia: Same comments as Ericsson, MTK and Vivo. |
| [**R4-2015505**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2015505.zip) Huawei, HiSilicon | Ericsson: Would be better not to duplicate the delay requirements here as it may lead to significantly increased maintenance efforts. Rather references can be made e.g. in following way: “within the delay specified in 8.6.3A.1” etc. |
| MTK: Agree with E///’s suggestion. |
| Qualcomm: In principle, the CR is okay with us. And agree with Ericsson’s suggestion. |
| Intel: agree with Ericsson. The delay requirement can be referred to 8.6.3A.1. otherwise we need to update interruption part when there are some updates in the delay requirement later. |
| Huawei (further comments): Thanks for the comments. We are fine with Ericsson’s suggestion and to revise the CR. |
| [**R4-2016166**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2016166.zip) Ericsson | vivo: fine for us. |
| Apple: This change/CR depends on Issue 1-1-2 which depends on whether RRC based simultaneous BWP switch on multiple CCs is define. |
| Qualcomm: Okay with us. |
| Intel: fine with the CR. |
| Nokia: We are fine with the change. |

## 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** |
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*Recommendations on WF/LS assignment*

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|  | **WF/LS t-doc Title** | **Assigned Company,**  **WF or LS lead** |
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### 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** |
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## Discussion on 2nd round (if applicable)

## Summary on 2nd round (if applicable)

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

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# Topic #2: UL Spatial Relation Info Switching in core part

## Companies’ contributions summary

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| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2014250**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014250.zip) | Apple | **Proposal #1: Define requirements for the case when UL signal has spatial relation to an unknown DL-RS.**  **Proposal #2: Do not consider additional time for time tracking when the DL-RS is unknown for a UL spatial relation switch.**  **Proposal #3: For MAC CE based uplink spatial relation info switch associated with DL-RS with unknown spatial relation the requirements are defined as: THARQ + 3ms + TL1-RSRP.**  **Proposal #4: For RRC based uplink spatial relation info switch associated with DL-RS with unknown spatial relation the requirements are defined as: TRRC-processing + TL1-RSRP.**  **Proposal #5: Do not define UE behavior or requirements during the transition period when UL signal is configured with unknown DL-RS.** |
| [**R4-2014771**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014771.zip) | MediaTek inc. | ***Proposal 1: Define unknown spatial relation switch requirement, but do not define UE’s behaviour during the transition period.***  ***Proposal 2: For MAC CE based unknown spatial relation, the delay requirement is: THARQ + 3ms+ TL1-RSRP.***  ***Proposal 3: For RRC based unknown spatial relation, the delay requirement is: TRRCprocessing + TL1-RSRP.*** |
| [**R4-2015308**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2015308.zip) | NTT DOCOMO, INC. | **Proposal 1: Do not define requirements when the UL signal has spatial relation to an unknown DL RS.** |
| [**R4-2015498**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2015498.zip) | Huawei, HiSilicon | **Proposal 1: Uplink spatial relation associated to an unknown DL RS is not a typical configuration.**  **Proposal 2: If it is justified the associated unknown DL RS is a possible configuration:**   * **the delay requirement for MAC CE based spatial relation info switching associated with unknown DL-RS for PUCCH and SP-SRS is THARQ + 3ms+ TL1-RSRP.** * **the delay requirement for RRC based spatial relation info switching associated with unknown DL-RS for P-SRS is TRRCprocessing + TL1-RSRP.** |

## Open issues summary and companies view’s collection

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

### Open issues and comments collection

**Issue 2-1-1: When the UL signal has spatial relation to an unknown DL RS,**

* Option 1(NTT Docomo): Do not define requirements
* Option 2(Huawei): is not a typical configuration
* Option 3(Apple, MTK): Define requirements
* Recommended WF:
  + Further discussion.

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| **Company** | **Comments** |
| Huawei | Option 2.  The possible circumstance is that UE never reported any information to network, or UE reported the L1-RSRP of the associated DL RS a long time ago. For the first case, network has no information of the DL beam, so it may be a blind decision for network to configure UE to use a target spatial domain filter for uplink transmission. For the second case, UE may move or rotate, the expired reporting result may be invalid. So in general, in some extent, this case is not typical in real network. |
| Ericsson | We are fine with Option 3, i.e., defining latency requirements for determining and applying spatial transmission filter when DL-RS associated with the target spatial relation is unknown. |
| MTK | This issue can be discussed together with Issue 2-1-2.  Even we agree to define the requirement for unknown scenario, we shall follow the same rule as TCI state switching, not to define UE behaviour during transition period. |
| vivo | Option 2. |
| Apple | If we can be guaranteed that UE will not be required to switch to an unknown TCI state or unknown UL spatial relation, then we don’t need to discuss the requirements for unknown case at all. Because this is not precluded by network, we think it’s necessary to define the delay requirements. |
| QC | In our opinion, option 1 is the consequence of option 2, hence we support both. |
| NTT DOCOMO, INC. | We support Option 1. Unless the UE behaviour when the UL signal has spatial relation to an unknown DL RS is clear, the requirements should not be defined. |
| Intel | support option 1 and 2. We don’t think it’s a typical scenario for the spatial info of UL signal associated with unknown DL-RS. |
| ZTE | We support option 3. |
| Nokia | Concerning UE requirement related to when the UL signal has spatial relation to an unknown DL RS, we prefer in general, that the UE shall not transmit in UL before the has regained timing information, TCI state knowledge and synchronization. Hence, we’re fine with option 3. We do not see this as a typical scenario. |

**Issue 2-1-2: Whether to define UE behavior during the transition period when UL signal is configured with unknown DL-RS**

* Option 1(Apple, MTK): Do not define
* Recommended WF:
  + Agree with option 1.

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| **Company** | **Comments** |
| Huawei | Support option 1. |
| Ericsson | We are OK with the recommended way forward. Although not our preference to have time periods of undefined UE behaviour, it is at least consistent with TCI state switching. |
| MTK | Option 1. |
| vivo | Option 1 |
| Apple | We support the recommended WF. |
| QC | Support option 1 |
| NTT DOCOMO, INC. | Support Option 1. |
| Intel | Support option 1. |
| ZTE | Okay with option 1. |
| Nokia | We can likely agree to the WF. However, it is not clear what ‘transition period’ means and how is it defined. Does this refer to the time between when UE shall stop transmitting on the source UL with known DL RS (Tharq+3ms) and until the UE has acquired DL RS timing to be used with the target UL spatial?  If this is the case, we should state that the UE is not transmitting during this period. Exactly how the UE behaviour is need not be defined except UL transmission is not allowed until timing has been acquired (according to Issue 2-1-3 delay). |

**Issue 2-1-3: Delay requirement for unknown spatial relation**

* Option 1(Apple, MTK):
  + For MAC-CE based: THARQ + 3ms + TL1-RSRP.
  + For RRC based: TRRC-processing + TL1-RSRP
* Option 2(Huawei):
  + If it is justified the associated unknown DL RS is a possible configuration:

- For MAC-CE based: THARQ + 3ms + TL1-RSRP.

- For RRC based: TRRC-processing + TL1-RSRP

* Recommended WF:
  + Further discussion. Depends on conclusion of issue 2-1-1.

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| **Company** | **Comments** |
| Huawei | Depends on the conclusion of issue 2-1-1. If we agreed to define the requirements for associated unknown DL RS, option 1 and option 2 are the same. |
| Ericsson | We are OK with the proposed requirements for MAC-CE and RRC based spatial relation switching. |
| MTK | Option 1 if we agree to define the requirements. |
| vivo | If requirements are needed, then either option 1 or 2 |
| Apple | Option 1. |
| QC | Same comment as Huawei |
| Intel | fine with both options. |
| ZTE | Option 1 |
| Nokia | Option 1 is fine. It is not clear what the additional line in option 2 refers to. |

### CRs/TPs comments collection

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| **CR/TP number** | **Comments collection** |
| [**R4-2016026**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2016026.zip) Ericsson | Huawei: don’t see problem of using *beamCorrespondenceWithoutUL-BeamSweeping* which is the capability specified in 38.306. |
| MTK: not suggest to change it. |
| Apple: We suggest keeping the original wording, perhaps correct it as: when *beamCorrespondenceWithoutUL-BeamSweeping* ~~sets~~ is set to 1 for UE capability. |
| Intel: don’t need to change. |
| [**R4-2015499**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2015499.zip) Huawei, HiSilicon | Ericsson: OK. |
| MTK:OK. |
| vivo: OK. |
| Intel: fine with the change. |
| Nokia: ok |

## 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** |
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*Suggestion on WF/LS assignment*

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|  | **WF/LS t-doc Title** | **Assigned Company,**  **WF or LS lead** |
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### 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** |
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## Discussion on 2nd round (if applicable)

## Summary on 2nd round (if applicable)

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

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|  | **Status summary** | |
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# Topic #3: Work plan for RRM enhancement

## Companies’ contributions summary

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| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2014566 | Intel |  |

## Open issues summary and companies view’s collection

**Issue 3-1-1: Work plan**

1. 3GPP RAN4 #97e meeting (November 2020)
   1. Discussions on:
      * Test case design method
      * Test case list
      * Draft CR split
   2. Agreements on:
      * Consensus on the test case methods and test case list
      * Draft CR split among the interested companies
2. 3GPP RAN4 #98e meeting (January 2021)
   1. Draft CR submission for all test cases
   2. Big CR to be prepared after the meeting based on the endorsed Draft CRs

* Recommended WF:
  + - Further discussion.

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| **Company** | **Comments** |
| Huawei | The work plan is fine. |
| Ericsson | We have concerns on bundling too many subtopics into the one and same big CR. Our preference is that there is one big CR for each subtopic, e.g. one for BWP switching, one for CGI reading, and so on. The justification is that it often are different delegates that cover different subtopics, and bundling all into one big CR would complicate the review process. |
| MTK | We’re fine with the work plan. |
| Apple | The work plan is fine with us. For Ericsson’s concern, the individual draft CRs based on work split will have to be reviewed and agreed upon first. |
| Intel | To Ericsson: the original purpose is to reduce the CR number. Individual Draft CR will be reviewed and agreed first. |
| ZTE | We are fine with the work plan. |
| Nokia | Generally, we are fine with the work plan. Share the similar concern with Ericsson, many topics in RRM enhancement WI, it will be easy way to have big CR for each topic. |

**Issue 3-1-2: Testcase list for RRM enhancement**

Moderator note: The following testcase list table will be updated during the meeting. Companies don’t need to provide comment for the 1st round.

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| Draft CR / Test cases | Company |
| BWP switching on multiple CCs |  |
| TC1: DCI-based and Timer-based simultaneous Active BWP Switch on multiple CCs on FR1 in EN-DC | Intel |
| TC2: DCI-based and Timer-based simultaneous Active BWP Switch on multiple CCs on FR2 in EN-DC |  |
| TC3: DCI-based and Timer-based simultaneous Active BWP Switch on multiple CCs on FR1 in SA |  |
| TC4: DCI-based and Timer-based simultaneous Active BWP Switch on multiple CCs on FR2 in SA |  |
|  |  |
| Spatial relation switch for uplink |  |
| TC1: MAC-CE based spatial relation switch associated with a known DL-RS in EN-DC | Mediatek |
| TC2: RRC based spatial relation switch associated with a known DL-RS in EN-DC | Huawei |
| TC3: MAC-CE based spatial relation switch associated with a known DL-RS in SA | Ericsson |
| TC4: RRC based spatial relation switch associated with a known DL-RS in SA | Nokia |
|  |  |
| CGI reading |  |
| TC1: SA intra-frequency CGI identification of NR neighbor cell in FR1 (PCell in FR1) | ZTE |
| TC2: SA inter-frequency CGI identification of NR neighbor cell in FR2 (PCell in FR2) | Ericsson |
| TC3: EN-DC intra-frequency CGI  identification of NR neighbor cell in FR1 (PSCell in FR1) | Nokia |
| TC4: EN-DC inter-frequency CGI identification of NR neighbor cell in FR2 (PSCell in FR2) | Huawei |
| TC5: SA CGI identification of E-UTRA neighbor cell (PCell in FR1) | Mediatek |
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| SRS carrier based switching |  |
| TC1: SA interruptions at NR SRS carrier based switching (PCell in FR1, SCell in FR1) | ZTE |
| TC2: SA interruptions at NR SRS carrier based switching (PCell in FR2, SCell in   FR2) | Ericsson |
| TC3: E-UTRAN – NR interruptions at NR SRS carrier based switching(PSCell in FR1, SCell in  FR1) | Nokia |
| TC4: E-UTRAN – NR interruptions at NR SRS carrier based switching (PSCell in FR2, SCell in  FR2) | Apple |
| TC5: E-UTRAN – NR interruptions   at E-UTRA SRS carrier based switching (PSCell in FR1, E-UTRA SCell) | Huawei |
| TC6: E-UTRAN – NR interruptions   at E-UTRA SRS carrier based switching (PSCell in FR2, E-UTRA SCell) | OPPO |
|  |  |
| Mandatory MG patterns |  |
| TC1: SA event triggered reporting tests with additional mandatory gap pattern (PCell in FR1, Neighbor cell   in FR1, Gap#2) | ZTE |
| TC2: SA event triggered reporting tests with additional mandatory gap pattern (PCell in FR2, Neighbor cell   in FR2, Gap#17) | Ericsson |
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| Multiple Scell activation/deactivation |  |
| TC1: EN-DC of LTE+FR1 NR without DRX with single MAC CE | Apple |
| TC2: EN-DC of LTE +FR1 NR (the existing activated serving cell) without DRX (test both per-FR MG capable UE and per-UE MG capable UE) with single MAC CE | Huawei |
| TC3: NR-DC without DRX (test per-FR MG capable UE) with dual MAC CEs | Mediatek |
|  |  |
| UE-specific CBW change |  |
| TC1: UE specific CBW change on FR1 NR PSCell in EN-DC (A.4.5.x) | Apple |
| TC2: UE specific CBW change on FR2 NR PSCell in EN-DC (A.5.5.x) | Huawei |
| TC3: UE specific CBW change on FR1 NR PCell in NR SA (A.6.5.x) | Ericsson |
| TC4: UE specific CBW change on FR2 NR PCell in NR SA (A.7.5.x) | NEC |
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| Inter-frequency measurement requirement without MG |  |
| TC1: SA event triggered reporting tests for FR1 without gap when DRX is not used (A.6.6.2.X) | CMCC |
| TC2: SA event triggered reporting tests for FR1 when DRX is used (A.6.6.2.X) | Apple |
| TC3: SA event triggered reporting tests for FR2 without gap when DRX is not used (A.7.6.2.X) | Huawei |
| TC4: SA event triggered reporting tests for FR2 without gap when DRX is used (A.7.6.2.X) | Mediatek |
|  |  |
| Inter-band CA requirement for FR2 UE measurement capability of independent Rx beam |  |
| TC 1: TBA | Company A |
| TC 2: TBA | Company B |
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## Summary for 1st round

### Open issues

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

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|  | **Status summary** |
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*Suggestion on WF/LS assignment*

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|  | **WF/LS t-doc Title** | **Assigned Company,**  **WF or LS lead** |
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### 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** |
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## Discussion on 2nd round (if applicable)

## Summary on 2nd round (if applicable)

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

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|  | **Status summary** | |
| **CR/TP/LS/WF number** | | **T-doc Status update recommendation** |
|  | |  |

# Topic #4: BWP Switching on multiple CCs in performance part

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2014251**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014251.zip) | Apple | **Proposal #1: Define testcases for BWP switch on multiple CCs for the following:**   * **Simultaneous BWP switch in NR-CA on 2 CCs for FR1+FR1 and FR2+FR2** * **Do not define tests with partial overlap BWP switch** * **Duplicate tests for SA and EN-DC** * **Define simultaneous BWP switch only for DCI based switch** * **Test interruption requirements along with delay requirements with BWP switch on multiple CCs** * **Define tests only with self-scheduling with BWP switch on multiple CCs**   **Proposal #2: Postpone defining testcases with RRC based simultaneous BWP switch until core requirement is finalized.** |
| [**R4-2014567**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014567.zip) | Intel Corporation | ***Proposal 1: For multiple BWP switching testcases, only consider BWP switches happens simultaneously in two CCs, i.e. FR1+FR1, FR2+FR2.***  ***Proposal 2: Only define test case for simultaneous BWP switch on multiple CCs. Don’t need to define test case for partial overlap BWP switching on multiple CCs.***  ***Proposal 3: All the testcase can be duplicated in both EN-DC and SA.***  ***Proposal 4: Both DCI+Timer based BWP switch can be tested in one testcase.***  ***Proposal 5: For both EN-DC and SA case, there are totally 3 cells where two cells are undergoing simultaneous BWP switch and one another cell is used to verify interruption delay.***  ***Proposal 6: Define testcase for self carrier scheduling firstly.***  ***Proposal 7: Similar with Rel-15, interruption test and delay test can be applied in one testcase.***  ***Proposal 8: Before designing the test case, clarify the applicable scenario and delay requirement for simultaneous RRC based BWP switch on multiple CCs firstly.***  ***Proposal 9: The total testcase list is:***   |  | | --- | | ***TC1: DCI-based and Timer-based simultaneous Active BWP Switch on multiple CCs on FR1 in EN-DC***  ***TC2: DCI-based and Timer-based simultaneous Active BWP Switch on multiple CCs on FR2 in EN-DC***  ***TC3: DCI-based and Timer-based simultaneous Active BWP Switch on multiple CCs on FR1 in SA***  ***TC4: DCI-based and Timer-based simultaneous Active BWP Switch on multiple CCs on FR2 in SA*** | |
| [**R4-2014778**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014778.zip) | MediaTek inc. | ***Proposal 1: Define 2CCs for multiple BWP switch test case: FR1+FR1, FR2+FR2, FR1+FR2.***  ***Proposal 2: Only define DCI+Timer based simultaneous multiple BWP switch test cases.***  ***Proposal 3: Define all the test cases duplicated in both EN-DC and SA and RAN4 shall further discuss whether introducing applicable rule.***  ***Proposal 4: Similar as legacy Rel-15, both DCI+Timer based BWP switch can be tested in one test case.***   |  |  |  |  |  | | --- | --- | --- | --- | --- | | DCI-based and Timer-based simultaneous Multiple BWP Switch | | | | | |  | # | LTE | PSCell or PCell | SCell | | EN-DC | 1 | FR1 | FR1 | FR1 | | 2 | FR1 | FR1 | FR2 | | 3 | FR1 | FR2 | FR2 | | SA | 4 | N.A | FR1 | FR1 | | 5 | N.A | FR1 | FR2 | | 6 | N.A | FR2 | FR2 |   ***Proposal 5: Only define self-scheduling test cases for multiple BWP switch.*** |
| [**R4-2014839**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014839.zip) | vivo | **Proposal 1: Use 2 CCs and FR1+FR1 combination for test cases for BWP switch delay over multiple CCs.**  **Proposal 2: Test cases only cover simultaneously BWP switch on multiple CCs.**  **Proposal 3: Add applicability rule for related test cases.**  **Proposal 4: Combine DCI+timer based BWP switch over multiple CCs into one test case and consider NR PCell + NR SCell firstly for NR SA scenario firstly.**  **Proposal 5: Define test case for scenario of Rel-16 BWP switch over multiple CCs firstly.**  **Proposal 6: Have same SCS configuration among all involved CCs. The test configuration could have a large SCS value if tight switch delay requirements are preferred to be verified.** |
| [**R4-2015507**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2015507.zip) | Huawei, HiSilicon | **Proposal 1: For simultaneous BWP switch, the requirements should be tested on 2 NR CCs for DCI/timer/RRC triggered BWP switch.**  **Proposal 2: No need to define test cases for partial overlap case for RRC-based and timer-based BWP switch on multiple CCs. Whether to introduce test cases for BWP on multiple CCs triggered by DCI for partial overlap case should be discussed.**  **Observation 2: There will be one more NR CCs involved if the interruptions is to be tested for NR SA.**  **Proposal 3: It is suggested to define test cases for self-scheduling DCI-based BWP switch on multiple CCs** |
| [**R4-2016167**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2016167.zip) | Ericsson | * **Proposal 1**: Tests for DCI based, timer based and RRC based simultaneous BWP switching requirements for multiple CCs are defined for both SA and EN-DC with 2 NR cells. * **Proposal 2**: Tests for timer based based non-simultaneous BWP switching requirements for multiple CCs are defined for both SA and EN-DC with 2 NR cells. * **Proposal 3**: Tests for DCI based and RRC based non-simultaneous BWP switching requirements for multiple CCs are defined for NR-DC with 2 NR cells: FR1 PCell and FR2 PSCell. * **Proposal 4**: In proposals 1 and 2 separate tests for SA and EN-DC are defined for both FR1 and FR2. * **Proposal 5**: Test case list is provided in table 1.  |  |  |  |  | | --- | --- | --- | --- | | **No** | **RRM Test cases** | **Test setup** | **Related RRM Requirements** | | **DCI based BWP switch** | | | | | 1 | Simultaneous DCI based BWP switch delay on multiple CCs in SA in FR1 | 2 NR FR1 cells | 8.6.2A.1 Simultaneous DCI based BWP switch delay on multiple CCs | | 2 | Simultaneous DCI based BWP switch delay on multiple CCs in SA in FR2 | 2 NR FR2 cells | | 3 | Simultaneous DCI based BWP switch delay on multiple CCs in EN-DC in FR1 | 1 LTE PCell, and 2 NR FR1 cels | | 4 | Simultaneous DCI based BWP switch delay on multiple CCs in EN-DC in FR2 | 1 LTE PCell, and 2 NR FR2 cels | | 5 | Non-simultaneous DCI based BWP switch delay on multiple CCs in NR-DC | FR1 PCell and FR2 PSCell | 8.6.2A.2 Non-simultaneous DCI based BWP switch delay on multiple CCs | | **Time based BWP switch** | | | | | 6 | Simultaneous timer based BWP switch delay on multiple CCs in SA in FR1 | 2 NR FR1 cells | 8.6.2B.1 Simultaneous timer based BWP switch delay on multiple CCs | | 7 | Simultaneous timer based BWP switch delay on multiple CCs in SA in FR2 | 2 NR FR2 cells |  | | 8 | Simultaneous timer based BWP switch delay on multiple CCs in EN-DC in FR1 | 1 LTE PCell, and 2 NR FR1 cels |  | | 9 | Simultaneous timer based BWP switch delay on multiple CCs in EN-DC in FR2 | 1 LTE PCell, and 2 NR FR2 cels |  | | 10 | Non-simultaneous timer based BWP switch delay on multiple CCs in SA in FR1 | 2 NR FR1 cells | 8.6.2B.2 Non-simultaneous timer based BWP switch delay on multiple CCs | | 11 | Non-simultaneous timer based BWP switch delay on multiple CCs in SA in FR2 | 2 NR FR2 cells | | 12 | Non-simultaneous timer based BWP switch delay on multiple CCs in EN-DC in FR1 | 1 LTE PCell, and 2 NR FR1 cels | | 13 | Non-simultaneous timer based BWP switch delay on multiple CCs in EN-DC in FR1 | 1 LTE PCell, and 2 NR FR2 cels | | **RRC based BWP switch** | | | | | 14 | Simultaneous RRC based BWP switch delay on multiple CCs in SA in FR1 | 2 NR FR1 cells | 8.6.3A.1 Simultaneous RRC based BWP switch delay on multiple CCs | | 15 | Simultaneous RRC based BWP switch delay on multiple CCs in SA in FR1 | 2 NR FR2 cells |  | | 16 | Simultaneous RRC based BWP switch delay on multiple CCs in SA in FR1 | 1 LTE PCell, and 2 NR FR1 cels |  | | 17 | Simultaneous RRC based BWP switch delay on multiple CCs in SA in FR1 | 1 LTE PCell, and 2 NR FR2 cels |  | | 18 | Non-simultaneous RRC based BWP switch delay on multiple CCs in NR-DC | FR1 PCell and FR2 PSCell | 8.6.3A.2 Non-simultaneous RRC based BWP switch delay on multiple CCs | |
| [**R4-2016381**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2016381.zip) | Nokia, Nokia Shanghai Bell | 1. 2 NR CCs can be considered in the test for simultaneous BWP switch on multiple CCs. 2. Specify the test cases only for simultaneous BWP switch on multiple CCs. 3. Specify DCI+Timer based simultaneous BWP switch on multiple CCs in one test case. 4. Specify only self-scheduling based test cases for simultaneous BWP switch on multiple CCs. 5. The test case list for BWP switch on multiple CCs could be:  |  |  | | --- | --- | |  | **Test cases** | | DCI+Timer based simultaneous BWP switch on multiple CCs | TC1: EN-DC with NR FR1 cell (E-UTRAN PCell + NR PSCell + NR SCell)  TC2: EN-DC with NR FR2 cell (E-UTRAN PCell + NR PSCell + NR SCell)  TC3: SA with NR FR1 cell (PCell + SCell)  TC4: SA with NR FR2 cell (PCell + SCell)  TC5: SA with NR FR1+FR2 cell (FR1 PCell + FR2 PSCell + FR2 SCell) (BWP switch only on FR2 cells) | | RRC based simultaneous BWP switch on multiple CCs | TC1: EN-DC with NR FR1 cell (E-UTRAN PCell + NR PSCell + NR SCell)  TC2: EN-DC with NR FR2 cell (E-UTRAN PCell + NR PSCell + NR SCell)  TC3: SA with NR FR1 cell (PCell + SCell)  TC4: SA with NR FR2 cell (PCell + SCell)  TC5: SA with NR FR1+FR2 cell (FR1 PCell + FR2 PSCell + FR2 SCell) (BWP switch only on FR2 cells) | |
| [**R4-2016572**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2016572.zip) | Qualcomm Incorporated | **Proposal 1: RAN4 to define performance test cases for multi-cell active BWP switching requirements based on the following principle about test/requirement coverage:**   * + RAT configuration     - EN-DC and NR standalone   + Frequency range     - FR1 and FR2 separately, i.e. no FR1 and FR2 CA/DC scenario   + The number of CCs     - 2 CCs for simultaneous BWP switching, i.e. no CC for interruption requirement verification purpose   + Overlapping of BWP switching     - Simultaneous case only, i.e. no partial overlap BWP switching   + BWP switching sequence in a test run     - DCI- and Timer-based BWP switching requirements are tested in sequence in the same test run     - RRC-based BWP switching requirements are tested separately as legacy test cases   + Self- vs. Cross-carrier scheduling DCI     - Self-carrier scheduling DCI based BWP switching scenario   + FFS on Applicability rule, e.g.     - test skipping/applicability rule for EN-DC and NR standalone if there are duplicated aspects from a UE point of view |
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## Open issues summary and companies view’s collection

*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 design

**Issue 4-1-1: Number of CCs undergoing multiple BWP switching**

* Option 1(Apple, Intel, MTK, vivo, Huawei, Ericsson, Nokia, Qualcomm): 2
* Recommended WF:
  + Agree on option 1.

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| **Company** | **Comments** |
| Huawei | We support the recommended WF. |
| Ericsson | We are OK with the recommended way forward. |
| MTK | We support the recommended WF. |
| vivo | Ok with the recommended WF. |
| Apple | We support the recommended WF. |
| Qualcomm | Support Option 1. |
| Intel | We support the recommended WF. |
| Nokia | We support the recommended WF. |

**Issue 4-1-2: CC combinations**

* Option 1(Apple, Intel, Qualcomm):
  + FR1+FR1
  + FR2+FR2
* Option 2 (MTK):
  + FR1+FR1
  + FR1+FR2
  + FR2+FR2
* Option 3 (vivo):
  + FR1+FR1
* Recommended WF:
  + Further discussion.

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| **Company** | **Comments** |
| Huawei | For simultaneous DCI-based BWP switch. The definition of N will be different for FR1+FR2 cases. For partial-overlap DCI-based BWP switch, FR1+FR2 DC is the only capable scenario. |
| Ericsson | We prefer Option 2. Particularly we think that Option 3 is too limiting with only FR1 – FR1. Furthermore for some scenarios only FR1+FR2 is possible e.g. non-simultaneous DCI and non-simultaneous RRC based BWP switching. |
| MTK | Option 2.  We agree with Huawei’s observations.  We should have some tests for testing UE’s behavior which claims it supports Per-FR gap capability. |
| Vivo | Ok with option 1. |
| Apple | We support Option 1. |
| Qualcomm | Option 1. |
| Intel | prefer option 1, in order to reduce the test complexity. |
| Nokia: | Generally we support Option 2, depends on the supporting scenarios in core requirements. |

**Issue 4-1-3: Test duplication for EN-DC and SA**

* Option 1(MTK, vivo, Qualcomm):
  + Duplicated. Further discuss about applicable rule
* Option 1a(Apple, Intel):
  + Duplicated.
* Recommended WF:
  + Agree with Option 1.

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| **Company** | **Comments** |
| Ericsson | We are fine with the recommended way forward. |
| MTK | Option 1. |
| Vivo | Ok with the recommended WF. |
| Apple | We are fine to support recommended WF, but would like to understand how the applicability rule will be defined. |
| Qualcomm | Option 1. |
| Intel | Option 1. |
| Nokia | We are fine with the recommended WF. |

**Issue 4-1-4: Interruption test is needed or not**

* Option 1(Apple, Intel):
  + Test interruption requirements along with delay requirements in one test
* Option 2(Qualcomm):
  + Don’t need interruption test.
* Recommended WF:
  + Further discussion.

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| **Company** | **Comments** |
| Ericsson | We prefer Option 1, i.e., fulfillment of interruption requirements needs to be tested, and interruption and latency can be tested in the same test case. |
| MTK | Option 1. |
| Apple | Option 1 |
| Qualcomm | Okay with Option 1 on an understanding that a separate set of test cases just for interruption requirement is not necessary. |
| Intel | Option 1. |
| Nokia | We support Option 1. |

**Issue 4-1-5: Cell configuration with or w/o interruption test**

Sub1: EN-DC case

* Option 1(Intel, MTK, Ericsson, Nokia):
  + LTE PCell + NR PSCell + NR SCell

Sub2: SA case

* Option 1(MTK, vivo, Ericsson):
  + NR PCell + NR SCell
* Option 2 (Intel):
  + NR PCell + 2 NR SCells
* Option 3(Nokia):
  + PCell + SCell
  + NR FR1+FR2 cell (FR1 PCell + FR2 PSCell + FR2 SCell) (BWP switch only on FR2 cells)
* Recommended WF:
  + For EN-DC case, agree with option 1. For SA case, depends on conclusion of 4-1-4.

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| **Company** | **Comments** |
| Huawei: | Agree with the recommended WF for EN-DC. For SA case, it depends on the conclusion of 4-1-4. We have a question for the second bullet for option 3. It is only for NR-DC cases, and it is necessary for the partial overlapping DCI/RRC cases, but we are not sure whether it is needed for the simultaneous cases. |
| Ericsson | For EN-DC case, our preference is Option 1, and for SA case, our preference is Option 1. |
| MTK | Both option 1. |
| vivo | Both option 1. |
| Apple | We support recommended WF for EN-DC case. For SA case we can still have interruption with CA case if there is SCS change with BWP switch on either CCs |
| Qualcomm | For EN-DC, support Option 1. If we don’t need a separate interruption test, okay with Option 1. |
| Intel | For EN-DC case, support Option 1. For SA, we are fine with both option 1 and option 2. |
| Nokia | For EN-DC case, we support Option 1. For SA case, we support Option 3. |

**Issue 4-1-6: Whether DCI+Timer based simultaneous BWP switch switching can be applied in one test**

* Option 1(Intel, MTK, Nokia, Qualcomm, vivo):
  + Both DCI+Timer based BWP switch can be tested in one testcase
* Option 2(Apple):
  + Define simultaneous BWP switch only for DCI based switch
* Recommended WF:
  + Agree with option 1.

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| **Company** | **Comments** |
| Huawei | Support option 1. |
| Ericsson | We think both DCI and Timer-based simultaneous BWP switch shall be tested. Whether in the same or in different test cases can be further discussed. |
| MTK | Option 1. |
| Vivo | Option 1 |
| Apple | We are ok to go with recommended WF. |
| Qualcomm | Oprion 1 |
| Intel | option 1. |
| Nokia | We support the recommended WF. |

**Issue 4-1-7: Simultaneous case or simultaneous + partial**

Sub1: For RRC based BWP switching

* Option 1(vivo, Nokia, Huawei, Qualcomm):
  + Only define test case for simultaneous case
* Option 2 (Apple, Intel, MTK):
  + Postpone defining testcases with RRC based simultaneous BWP switch and clarify the scenario first.
* Option 3 (Ericsson):
  + Define test case for both simultaneous and partial overlap case

Sub2: DCI/Timer based BWP switching:

* Option 1(Apple, Intel, MTK, vivo, Nokia, Qualcomm)
  + Only define simultaneous multiple BWP switch test cases.
* Option 2(Huawei):
  + No need to define test cases for partial overlap case for timer-based BWP switch on multiple CCs. Whether to introduce test cases for BWP on multiple CCs triggered by DCI for partial overlap case should be discussed
* Option 3 (Ericsson):
  + Define test case for both simultaneous and partial overlap case
* Recommended WF:
  + For RRC based BWP switching test case, suggest to postpone and clarify the scenario in core part first. For DCI/Timer based BWP switching, it’s suggested to only define test for simultaneous case.

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| **Company** | **Comments** |
| Huawei | We think there is no need to define partial overlap cases for RRC-based and timer-based BWP switch as sequential processing is allowed in the requirements. As for DCI-based partial overlap case, we think it is necessary to test the UE capable UE that the BWP switch in two different CGs will be performed in parallel. |
| Ericsson | Sub1: RRC based BWP switching: we are ok with Option 2, i.e., first clarify applicability of RRC-based simultaneous BWP switching, (issue 1-1-1) and then discuss related test cases – if any.  Sub2: For DCI/Timer based BWP switching, we think both simultaneous case and partially overlapping case shall be tested. Hence our preference is Option 3. |
| MTK | Sub 1: Option 2.  Sub 2: Option 1.  As discussed in e-mail thread before the meeting, the overall delay is much longer in partial overlap case than simultaneous cases. So we don’t think any UE which can pass simultaneous case will fail in partial overlap case. |
| vivo | For sub1, we agree with option 2 since the user case needs to be clarified. For sub 2 we agree with option 1. |
| Apple | Sub 1: Option 2  Sub 2: Option 1 |
| Qualcomm | Sub 1: Option 2  Sub 2: Option 1. Share the same view as MTK. |
| Intel | Sub 1: Option 2. It’s better to discuss the RRC based BWP switch scenario first before defining the testcase.  Sub 2: Option 1. Agree with MTK. |
| Nokia | We support Option 1 for Sub 1 and Sub 2, considering the discussion in the core part for RRC-based BWP switch on multiple CCs, We are fine with the recommended WF. |

**Issue 4-1-8: Whether define test for Cross-carrier scheduling based Simultaneous BWP switching**

* Option 1(Apple, Intel, MTK, Nokia, Qualcomm):
  + Only define self-scheduling based test cases.
* Option 1a(Huawei):
  + Suggested to define test cases for self-scheduling DCI-based BWP switch on multiple CCs
* Option 1b(vivo):
  + Define test case for scenario of Rel-16 BWP switch over multiple CCs firstly
* Recommended WF:
  + Agree with option 1.

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| **Company** | **Comments** |
| Huawei | Agree with the recommended WF. |
| Ericsson | Cross carrer scheduling is not part of the RRM enhancement WI but part of MR-DC. Hence no cross carrier scheduling test cases are to be introduced within the context of NR\_RRM\_enh. This does however not rule out that related test cases are introduced within the MR-DC WI. With that clarification/condition, we are fine with the recommended way forward. |
| MTK | Option 1.  The further discussion on cross scheduling can be in MR-DC WI. |
| vivo | Agree with the recommended WF. |
| Apple | We support recommended WF |
| Qualcomm | Option 1. |
| Intel | Option 1.  To Ericsson: Here we don’t rule out the cross-carrier related test case and they can be defined in MR-DC section. We just don’t define cross-carrier related test case in NR\_RRM\_enh session. |
| Nokia | We support recommended WF. |

**Issue 4-1-9: Numerology difference b/w cells and/or BWPs**

* Option 1(vivo):
  + Have same SCS configuration among all involved CCs. The test configuration could have a large SCS value if tight switch delay requirements are preferred to be verified.
* Recommended WF:
  + Agree that SCS configuration is the same for all involved CCs.

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| **Company** | **Comments** |
| Ericsson | Feasibility of Option 1 may depend on the outcome of Issue 4-1-2. If there is a mix of FR1-FR2 cells, it may not be feasible to have same SCS on all CCs. For CCs within same FR samt SCS can be assumed, though. |
| MTK | Agree with E///. We don’t need to have this assumption. |
| Vivo | Agree that this issue depends on the outcome of 4-1-2. |
| Apple | No strong view. If we have FR1+FR1 with 15KHz + 30KHz total delay would still be based on requirement of 15KHz SCS. |
| Qualcomm | At least for simultaneous BWPs in the same FR, support Option 1. |
| Intel | More clarification about option 1 is needed. For BWP switch in the same FR, they will have same SCS. |
| Nokia | Agree with Ericsson and MTK. |

### Sub-topic 4-2: Test case list

Moderator note: The following testcase list is dependent on the conclusion of testcase design in Sub-topic 4-1. Suggest companies focus on the Sub-topic 4-1 first. The testcase list discussion can start after 1st round discussion.

**Issue 4-2-1: Testcase list for self scheduling simultaneous BWP switch on multiple CCs**

* Option 1(Intel):
  + 4 testcases for DCI+timer based simultaneous BWP switch on multiple CCs
* Option 2(MTK):
  + 6 testcases for DCI+timer based simultaneous BWP switch on multiple CCs
* Option 3(Ericsson):
  + 18 testcases for DCI+timer/RRC based simultaneous/non-simultaneous BWP switch on multiple CCs
* Option 4(Nokia):
  + 10 testcases for DCI+timer/RRC based simultaneous BWP switch on multiple CCs
* Recommended WF:
  + Dependent on the Conclusion of Sub-topic 4-1.

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| **Company** | **Comments** |
| Huawei | We suggest to first discuss the high-level principles about the scope of the testing before the details of the test cases list. |
| MTK | We can agree on the high-level principles firstly. |
| vivo | Similar view as MTK and HW, suggest to solve open issues firstly. |
| Apple | We need to agree on the other issues before we can have have final number of testcases. |
| Intel | Solve the main issue in Sub-topic 4-1 firstly. |

### CRs/TPs comments collection

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

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| **CR/TP number** | **Comments collection** |
| [**R4-2014568**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014568.zip) Intel Corporation | Apple: We need to agree on testcases and scenario for BWP switch on multiple CCs first. |
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| [**R4-2014838**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014838.zip) vivo | Apple: We need to agree on testcases and scenario for BWP switch on multiple CCs first. |

## 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** |
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*Suggestion on WF/LS assignment*

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|  | **WF/LS t-doc Title** | **Assigned Company,**  **WF or LS lead** |
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### 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** |
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## Discussion on 2nd round (if applicable)

## Summary on 2nd round (if applicable)

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

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|  | **Status summary** | |
| **CR/TP/LS/WF number** | | **T-doc Status update recommendation** |
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# Topic #5: UL Spatial Relation Info Switching in performance part

## Companies’ contributions summary

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| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2014569**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014569.zip) | Intel Corporation | ***Proposal 1: The total test list for uplink spatial relation switch is:***   1. ***FR2 EN-DC MAC-CE based uplink spatial relation switch for PUCCH*** 2. ***FR2 EN-DC RRC based uplink spatial relation switch for pSRS*** 3. ***FR2 SA MAC-CE based uplink spatial relation switch for PUCCH*** 4. ***FR2 SA RRC based uplink spatial relation switch for pSRS*** |
| [**R4-2016014**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2016014.zip) | Ericsson | In this contribution we have provided some background information on the proposed test case for *MAC-CE based spatial relation info switching.* |

## Open issues summary and companies view’s collection

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

### Open issues and comments collection

**Issue 5-1: Testcase list for UL spatial relation info switch**

* Tentative agreement :

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| TC1: MAC-CE based spatial relation switch associated with a known DL-RS in EN-DC |
| TC2: RRC based spatial relation switch associated with a known DL-RS in EN-DC |
| TC3: MAC-CE based spatial relation switch associated with a known DL-RS in SA |
| TC4: RRC based spatial relation switch associated with a known DL-RS in SA |

* Recommended WF:
  + Agree about the tentative aggrement.

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| **Company** | **Comments** |
| Huawei | Agree with the recommended WF.  More detailed: TC1and TC3 are for PUCCH, and TC2 and TC 4 for periodic SRS. |
| Ericsson | We are fine with the recommended way forward. |
| MTK | We are fine with the recommended way forward. |
| vivo | Agree with the recommended way forward. |
| Apple | Do we need an applicability rule here for SA and EN-DC testcases? There is no interruption requirement which is tested with EN-DC and SA test. The requirements are the same for both. |
| Nokia | We are fine with the WF. |

### CRs/TPs comments collection

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

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| **CR/TP number** | **Comments collection** |
| [**R4-2014775**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014775.zip) MediaTek inc. | Ericsson: Requirement for pass seems to be missing (e.g. “The rate of correct events observed during repeated tests shall be at least 90%.”). |
| MTK: Thank you for E///’s comments. We’ll update it later. |
| Apple: CR looks fine. Not sure if we should have rate of correct events observed for this case as its switching delay.  General question is how is it verified that the UE is transmitting on a particular TX beam before and after the switch? |
| Intel: looks fine to us. Whether the configuration of *beamCorrespondenceWithoutUL-BeamSweeping* to be 1 is needed? |
| [**R4-2015500**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2015500.zip) Huawei, HiSilicon | Ericsson: Seems SRS-SpatialRelation0 and SRS-SpatialRelation1 are missing in the test case description. Would expect SRS configurations specified in table under T1 and T2, etc. Please check. |
| QC: Test requirement missing ms to slot conversion |
| [**R4-2016015**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2016015.zip) Ericsson | Apple: Not sure if this is correct for testing delay requirement  The rate of correct events observed during repeated tests shall be at least 90%. |
| QC: (1) Test requirement missing ms to slot conversion (2) 0.5s may not be enough if “The duration of T1 is selected such that it is guaranteed that the UE has been provided enough time for beam sweeping and for acquiring a stable reading of SSB1 before T2”. In A.5.6.3.1.3 L1-RSRP test with the same SSB period, 1200ms+640slot is needed before the first L1-RSRP report is sent. |
| [**R4-2015885**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2015885.zip) Nokia, Nokia Shanghai Bell | Huawei: the zip file is empty. |
| Ericsson: This zip archive is empty. |

## 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** |
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*Suggestion on WF/LS assignment*

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|  | **WF/LS t-doc Title** | **Assigned Company,**  **WF or LS lead** |
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### 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** |
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## Discussion on 2nd round (if applicable)

## Summary on 2nd round (if applicable)

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

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|  | **Status summary** | |
| **CR/TP/LS/WF number** | | **T-doc Status update recommendation** |
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