**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.
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## 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. |
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**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.  |
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### 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. |
|  |
| [**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.  |
| [**R4-2015504**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2015504.zip)Huawei, HiSilicon |  |
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| [**R4-2015505**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2015505.zip) Huawei, HiSilicon |  |
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| [**R4-2016166**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2016166.zip) Ericsson |  |

## 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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## Discussion on 2nd round (if applicable)

## Summary on 2nd round (if applicable)

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

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

### 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. |
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**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. |
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**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. |
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### 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. |
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| [**R4-2015499**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2015499.zip) Huawei, HiSilicon |  |
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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**  |
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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. |
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**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 |  |
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| 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 |
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| 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 |
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| 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 |
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| 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**  |
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# Topic #4: BWP Switching on multiple CCs in performance part

## Companies’ contributions summary

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| **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:***

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| ***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*** |

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| [**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.***

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| 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.

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| **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
 |
|  |  |  |

## 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. |
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**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. |
|  |  |

**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** |
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**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** |
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**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. |
|  |  |

**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. |
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**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. |
|  |  |

**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. |
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**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** |
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### 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. |
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### CRs/TPs comments collection

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

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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 |  |
|  |
|  |
| [**R4-2014838**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014838.zip) vivo |  |

## 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

|  |  |  |
| --- | --- | --- |
| **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 :

|  |
| --- |
| 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. |
|  |  |

### 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. |  |
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| [**R4-2015500**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2015500.zip) Huawei, HiSilicon |  |
|  |
| [**R4-2016015**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2016015.zip) Ericsson |  |
|  |
| [**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. |
|  |

## 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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