**3GPP TSG-RAN4 Meeting #97-e R4-20xxxxx**

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

**Agenda item:** 7.13

**Source:** Moderator (Apple)

**Title:** Email discussion summary for [96e][220] NR\_RRM\_Enh\_RRM\_3

**Document for:** Information

# Introduction

This email discussion summary includes Inter-band CA requirement for FR2 UE measurement capability of independent Rx beam and/or common beam (7.13.1.5), relevant papers of “multiple SCell activation/deactivation, inter-frequency measurements without MG, and UE-specific BW change” (7.13.1.6), and test cases of “Multiple Scell activation/deactivation” (7.13.2.2.2), “Inter-frequency measurement requirement without MG”(7.13.2.2.5), “ UE-specific CBW change”(7.13.2.2.7) and “Inter-band CA requirement for FR2 UE measurement capability of independent Rx beam”(7.13.2.2.9).

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

* 1st round:
	+ Stage 0: Session chairs announce the set of email threads (no later than Monday 8am UTC, Nov. 2)
	+ Stage 1: Moderators kick off email discussion (Monday Nov. 2)
	+ Stage 2: Companies provide comments for the 1st round (Nov. 2 – Wednesday 6pm UTC Nov. 4)
	+ Stage 3: Moderators summarize the status and possible proposals, recommending what decisions can be made for 1st round. A formal t-doc will be used (Thursday 6pm UTC, Nov. 5)
	+ Stage 4: After receiving the summary from moderators, session chair may approve documents, make agreements or assign new CRs, WFs, LSs, etc. (no later than Monday 8am UTC, Nov. 9)
* 2nd round:
	+ Stage 5: Companies provide comments for 2nd round.
		- Draft WF/LS and revised CRs/TPs shall be shared by Wednesday 1am UTC, Nov. 11.
		- Commenting shall stop by Wednesday 11pm UTC, Nov. 11.
		- Formal tdocs of WF/LS/CRs/TPs shall be uploaded to the Inbox (except Cat A CRs) by Thursday 1am UTC, Nov. 12.
		- Draft moderator summary shall be shared by Thursday 9am UTC, Nov. 12, but moderators are strongly encouraged to share it earlier if possible and delegates to comment as early as possible.
	+ Stage 6: Moderators provide 2nd round summary with a formal tdoc by Thursday 6pm UTC, Nov. 12.
	+ Stage 7: Session chairs announce close of sessions (no later than 6pm UTC, Nov. 13). Final decisions will be captured in Chairman meeting report (to be shared after the meeting is closed)

# Topic #1: Inter-band CA requirement for FR2 UE measurement capability of independent Rx beam and/or common beam (7.13.1.5)

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

## Companies’ contributions summary

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| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2014275 | Apple | Clean up the CBM specific RRM requirement in TS38.133. |
| R4-2014873 | MediaTek inc. | Proposal 1: Not necessary to specify the requirements for ‘SCell being activated belongs to FR2 and there is an active serving cell on that FR2 band and the PCell or PSCell is in FR2 and the PCell or PSCell and SCell being activated are in a band pair with independent beam management’. |
| R4-2014874 | MediaTek inc. | Clarify the requiremrent is also applicable for “if the PCell/PSCell and the target SCell are with FR1-FR2 CA. |
| R4-2015309 | NTT DOCOMO, INC. | Proposal 1: Additional requirement for the remaining issue is not needed.Tentative agreement FFS:SCell activation delay requirements for IBM UE* Not necessary to specify the requirements for ‘SCell being activated belongs to FR2 and there is an active serving cell on that FR2 band and the PCell or PSCell is in FR2 and the PCell or PSCell and SCell being activated are in a band pair with independent beam management’
 |
| R4-2015985 | Intel Corporation | Following changes are introduced: into TS 38.133:* To move to a separate clause the clarification of condition of measurement restriction requirements for RLM in CA scenario.
* To move to a separate clause the clarification of condition of measurement restriction requirements for BFD in CA scenario
* To move to a separate clause the clarification of condition of measurement restriction requirements for CBD in CA scenario
* To move to a separate clause the clarification of condition of measurement restriction requirements for L1-RSRP measurements in CA scenario
* To move to a separate clause the clarification of condition of measurement restriction requirements for L1-SINR measurements in CA scenario
 |
| R4-2016576 | Qualcomm Incorporated | **Proposal 1: RAN4 to revisit the previous agreements “*Beam management resources on one cell in each band may be configured*” and “*Network may also configure beam management resources only on one cell such as Pcell, e.g. if network knows nodes on both bands are collocated*” and update them as follows:*** IBM UEs shall be able to add/configure/activate cells on both FR2 inter-band CCs only when beam management resources are configured in the both bands irrespective of network deployment, e.g. collocated vs. non-collocated.
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## Open issues summary

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

### Sub-topic 1-1 SCell activation requirement for FR2 FR2 inter-band CA

*Sub-topic description:*

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

**Issue 1-1: Necessity of SCell activation requirement with existing serving cell on same FR2 band**

* Proposals (MTK, NTT DOCOMO)
	+ Not necessary to specify the requirements for ‘SCell being activated belongs to FR2 and there is an active serving cell on that FR2 band and the PCell or PSCell is in FR2 and the PCell or PSCell and SCell being activated are in a band pair with independent beam management’.
* Recommended WF
* *Tentative agreements:*
	+ Not necessary to specify the requirements for ‘SCell being activated belongs to FR2 and there is an active serving cell on that FR2 band and the PCell or PSCell is in FR2 and the PCell or PSCell and SCell being activated are in a band pair with independent beam management’

### Sub-topic 1-2 Beam management resources for IBM UE

*Sub-topic description:*

In WF R4-2005353 (RAN4 #94bis-e), it was agreed that,

Beam management resource configuration for FR2 inter-band CA combination with independent beam:

* Beam management resources on one cell in each band may be configured.
* Network may also configure beam management resources only on one cell such as Pcell, e.g. if network knows nodes on both bands are collocated.

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

**Issue 1-2: Beam management resources for IBM UE**

* Proposals (QC, Apple, MTK, Intel):

RAN4 to revisit the previous agreements “*Beam management resources on one cell in each band may be configured*” and “*Network may also configure beam management resources only on one cell such as Pcell, e.g. if network knows nodes on both bands are collocated*” and update them as follows:

* + IBM UEs shall be able to add/configure/activate cells on both FR2 inter-band CCs only when beam management resources are configured in the both bands irrespective of network deployment, e.g. collocated vs. non-collocated.
* Recommended WF
	+ Continue discussion in the 2nd round and the agreement will be captured in the WF.

## Companies views’ collection for 1st round

### Open issues

**Issue 1-1: Necessity of SCell activation requirement with existing serving cell on same FR2 band**

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| --- | --- |
| **Company** | **Comments** |
| Ericsson | We are OK with the recommended way forward. |
| Apple | Agree with recommended WF |
| MediaTek | Agree with the recommended WF, because the existing requirement already covers this scenario.  |
| Huawei | We can agree with the recommended WF |
| Qualcomm | Agree with WF |
| NTT DOCOMO, INC. | Agree with recommended WF |
| Nokia | Although we were promoting adding such requirements as it would otherwise leave the existing requirements unclear, we can compromise to the recommended WF. We are not fully agreeing with MTK that current requirements cover what we have discussed – however, this can be addressed later. |
| Intel | Agree with recommended WF. |

**Issue 1-2: Beam management resources for IBM UE**

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| **Company** | **Comments** |
| Ericsson | Question to Qualcomm: In our understanding there is no option today to indicate to UE to use BM on other band. Does the proposal make any difference for TS 38.133, or is it more about making a RAN4 agreement where we indicate that we will not ask RAN2 for otherwise necessary signalling support? |
| Apple | Agree with Qualcomm proposal |
| MediaTek | Agree with the recommended WF |
| Huawei | We have same question to Qualcomm: does the proposal have any impact on current specification of TS38.133? If yes, what is the impact? |
| Qualcomm | We wanted to clarify the previous agreement because it can be read that IBM UE should also be able to support CBM if BM resource is present in only one band. This may create unnecessary confusion between companies/working groups. |
| NTT DOCOMO, INC. | We have understood that previous agreement means “it’s up to NW if beam management resoureces are configured to the UE. At least one cell needs to be configured the beam management resources to keep the connection”. If our understanding is correct, we would like to ask Qualcomm what is the main motivation of the proposal? |
| Nokia | Question to Qualcomm:We would like to clarify the proposal – or at least understand if our clarified proposal is what is proposed:IBM UEs is only required to add/configure/activate cells on each FR2 inter-band CCs if beam management resources are configured and transmitted in each of the bands. We are wondering if following line is needed? ‘irrespective of network deployment, e.g. collocated vs. non-collocated’ Would this be known to the UE? |
| Intel | Agree with recommended 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** |
| R4-2014275 (Apple CR) | Ericsson: OK. |
| MTK: OK, because no CBM requirements in R16. |
| Qualcomm: Okay |
| DCM: We are fine |
| Nokia: The CR would need some further updates. After the change it is not clear what the line ‘The requirements in this clause could not be applicable if UE is required to perform beam failure detection on more than 1 serving cell per band’ really mean (change 1, 2 and 3). |
| Intel: Agree. There is no CBM in Rel-16 |
| R4-2014874 (MTK CR) | Ericsson: OK. |
| Apple: fine with this CR |
| MTK: The intention is to also cover the original requirements before the introduction of inter-band CA requirements. |
| Qualcomm: Okay |
| DCM: We are fine. |
| Nokia: We are as such fine with the clarification but would suggest clarifying the requirement such that it more readable in the future:If the PCell/PSCell and the target SCell are configured as~~with~~ FR1-FR2 CA or, if the PCell/PSCell and the target SCell are in a FR2 band pair with independent beam management and the target SCell is unknown to UE and semi-persistent CSI-RS is used for CSI reporting, provided that the side condition Ês/Iot ≥ -2dB is fulfilled, then Tactivation\_time isWith these changes the CR is agreeable. |
| Intel: Agree |
| R4-2015985 (Intel CR) | Apple: fine with this CR |
| MTK: OK, it is editorial change. |
| Qualcomm: Okay |
| DCM: We are fine. |
| Nokia: Change is agreeable. |

## 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**  |
| **Issue 1-1: Necessity of SCell activation requirement with existing serving cell on same FR2 band** | *Tentative agreements:*Not necessary to specify the requirements for ‘SCell being activated belongs to FR2 and there is an active serving cell on that FR2 band and the PCell or PSCell is in FR2 and the PCell or PSCell and SCell being activated are in a band pair with independent beam management’*Candidate options:**Recommendations for 2nd round:*This issue is closed, and will be captured in WF.  |
| **Issue 1-2: Beam management resources for IBM UE** | *Tentative agreements:*No tentative agreement in 1st round. Based on the 1st round discussion, 4 companies supported QC’s proposal while 4 company have questions on this proposal. *Candidate options:** Option 1 (QC, Apple, MTK, Intel): IBM UEs shall be able to add/configure/activate cells on both FR2 inter-band CCs only when beam management resources are configured in the both bands irrespective of network deployment, e.g. collocated vs. non-collocated.

*Recommendations for 2nd round:*Continue discussion in the 2nd round and the agreement will be captured in the WF. |

*Recommendations on WF/LS assignment*

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| --- | --- | --- |
|  | **WF/LS t-doc Title**  | **Assigned Company,****WF or LS lead** |
| #1  | WF on R16 RRM enhancement part 3 - FR2 inter-band CA RRM | Huawei |

### CRs/TPs

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

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| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation**  |
| R4-2014275 (Apple CR) | *To be revised* |
| R4-2014874 (MTK CR) | *To be revised* |
| R4-2015985 (Intel CR) | *Agreeable* |

## Discussion on 2nd round (if applicable)

**Issue 1-2: Beam management resources for IBM UE**

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| **Company** | **Comments** |
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## Summary on 2nd round (if applicable)

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

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

# Topic #2: Multiple SCell activation/deactivation miantenance (7.13.1.6)

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

## Companies’ contributions summary

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| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2014772 | MediaTek inc. | Observation 1: If network cannot guarantee transmitting the same Tx beam at the same time for different SCell(s) being activated, the timing difference between each SCell will result in additional interference on UE’s receiver.Observation 2: If network cannot guarantee transmitting the same Tx beam at the same time for different SCell(s) being activated, the UE’s AGC re-tuning will face big problem in intra-band. Proposal 1: The network should guarantee the transmitted signals from Scells have the same downlink spatial domain transmission filter on one OFDM symbol in intra-band FR1. |
| R4-2015771 | Huawei, HiSilicon | Proposal 1: Common Tx beam for FR1 intra-band contiguous CA should not be taken as a generic assumption for all RRM requirements.Proposal 2: Extend the UE requirement (to skip cell detection for unknown FR1 SCell that is intra-band contiguous to active serving cell) to single SCell activation.Proposal 3: No requirement apply for other SCells, if no requirements apply for any of the FR1 unknown SCell activated with the same MAC CE.Proposal 4: Multiple SCell activation requirements apply provided that SMTC offset is same for all SCells activated by the same MAC CE. |
| R4-2015772 | Huawei, HiSilicon | Based on 15771 |
| R4-2016019 | Ericsson | Introducing the following corrections:* Removing brackets from side condition, i.e., Ês/Iot ≥ -2dB
 |
| R4-2016574 | Qualcomm Incorporated | Proposal 1: RAN4 to revisit one of conditions for multiple SCell activation requirement for FR1 contiguous CA, and update it as follows:• Replace “its SSB DL Tx beam is same as the corresponding SSB DL Tx beam at the same SSB position of contiguous FR1 known cell or contiguous FR1 active serving cell” with “its MRTD with contiguous FR1 known cell or contiguous FR1 active serving cell is smaller than or equal to CP duration with respect to the to-be-activated SCell’s SSB numerology”• Replace “its SSB DL Tx beam is different as the corresponding SSB DL Tx beam at the same SSB position of contiguous FR1 known cell or contiguous FR1 active serving cell” with “its MRTD with contiguous FR1 known cell or contiguous FR1 active serving cell is larger than CP duration with respect to the to-be-activated SCell’s SSB numerology” |
| R4-2016583 | Qualcomm Incorporated | According to 16574 |

## Open issues summary

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

### Sub-topic 2-1 Tx beam assumption of FR1 intra-band contiguous CA

*Sub-topic description:*

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

**Issue 2-1: Tx beam assumption of FR1 intra-band contiguous CA**

* Option 1 (MTK): The network should guarantee the transmitted signals from Scells have the same downlink spatial domain transmission filter on one OFDM symbol in intra-band FR1.
	+ Option 1a (Apple): The network should guarantee the transmitted signals from Scells have the same downlink spatial domain transmission filter on one OFDM symbol in intra-band contiguous FR1.
* Option 2 (Huawei, ZTE, Nokia): Common Tx beam for FR1 intra-band contiguous CA should not be taken as a generic assumption for all RRM requirements
* Option 3 (Qualcomm, Ericsson): RAN4 to revisit one of conditions for multiple SCell activation requirement for FR1 contiguous CA, and update it as follows:
	+ Replace “its SSB DL Tx beam is same as the corresponding SSB DL Tx beam at the same SSB position of contiguous FR1 known cell or contiguous FR1 active serving cell” with “its MRTD with contiguous FR1 known cell or contiguous FR1 active serving cell is smaller than or equal to CP duration with respect to the to-be-activated SCell’s SSB numerology”
	+ Replace “its SSB DL Tx beam is different as the corresponding SSB DL Tx beam at the same SSB position of contiguous FR1 known cell or contiguous FR1 active serving cell” with “its MRTD with contiguous FR1 known cell or contiguous FR1 active serving cell is larger than CP duration with respect to the to-be-activated SCell’s SSB numerology”
* Option 3a (MTK, Apple, QC): RAN4 to revisit one of conditions for multiple SCell activation requirement for FR1 contiguous CA, and update it as follows:
	+ Replace “its SSB DL Tx beam is same as the corresponding SSB DL Tx beam at the same SSB position of contiguous FR1 known cell or contiguous FR1 active serving cell” with “its RTD with contiguous FR1 known cell or contiguous FR1 active serving cell is smaller than or equal to CP duration with respect to the to-be-activated SCell’s SSB numerology and its reception power difference with contiguous FR1 known cell or contiguous FR1 active serving cell is smaller than or equal to XdB”, X is FFS.
	+ Replace “its SSB DL Tx beam is different as the corresponding SSB DL Tx beam at the same SSB position of contiguous FR1 known cell or contiguous FR1 active serving cell” with “its RTD with contiguous FR1 known cell or contiguous FR1 active serving cell is larger than CP duration with respect to the to-be-activated SCell’s SSB numerology or its reception power difference with contiguous FR1 known cell or contiguous FR1 active serving cell is larger than XdB”, X is FFS.
* Recommended WF
	+ Continue discussion in the 2nd round and the agreement will be captured in the WF.

### Sub-topic 2-2 Maintenance of R16 FR1 SCell activation requirement

**Issue 2-2-1: Extend the assumption in FR1 multiple SCells activation to single FR1 SCell activation**

* Option 1 (HW, Ericsson, Apple, ZTE, Nokia):
	+ Extend the UE requirement (to skip cell detection for unknown FR1 SCell that is intra-band contiguous to active serving cell) to single SCell activation, from Rel-16 onwards.
* Option 2 (MTK, QC):
	+ FFS on option 1.
* Recommended WF
	+ Continue discussion in the 2nd round and the agreement will be captured in the WF

**Issue 2-2-2: Requirement applicability on the other being-activated SCells during the FR1 multiple SCells activation**

* Option 1 (Huawei, Ericsson, Apple, QC, ZTE):
	+ No requirement apply for other being-activated SCells, if no requirements apply for any of the FR1 unknown SCell activated with the same MAC CE

Note: Moderator reworded the proposal by adding “being-activated”.

* Option 2 (MTK, Nokia):
	+ FFS on option 1.
* Recommended WF
	+ Continue discussion in the 2nd round and the agreement will be captured in the WF.

**Issue 2-2-3: Condition of SMTC configuration to apply multiple SCell activation requirement**

* Option 1 (Huawei, Apple, MTK, QC):
	+ Multiple SCell activation requirements apply provided that SMTC offset and periodicity is same for all SCells activated by the same MAC CE
* Option 2 (Ericsson, Nokia):
	+ Disagree with option 1.
* Recommended WF
	+ Continue discussion in the 2nd round and the agreement will be captured in the WF.

## Companies views’ collection for 1st round

### Open issues

**Issue 2-1: Tx beam assumption of FR1 intra-band contiguous CA**

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| **Company** | **Comments** |
| Ericsson | We support Option 3. For the activation of intra-band contiguous unknown FR1 SCell, it is the timing and not the spatial transmission filter that is the key. Omni-directional antennas are assumed in FR1, but UE need the timing information to know where in time to extract the SSB for the SCell to be activated when kick-starting the control loops. Qualcomm’s proposal captures this very well and without introducing additional and unnecessary constraints and limitations.One question to Qualcomm though: The proposal states “MRTD”. Should it not be just ‘receive time difference’? MRTD is a specified maximum value. |
| Apple | Propose an option 1a for FR1 intra-band contiguous CA:* Option 1a (Apple): The network should guarantee the transmitted signals from Scells have the same downlink spatial domain transmission filter on one OFDM symbol in intra-band contiguous FR1.

Our comments to option 3 is that, the condition of MRTD≤CP may not be equivalent to the condition of same Tx beam, because we are not sure if it would result into one case that MRTD could be within one range but the detectability is different between two SSBs on two CCs. |
| MTK | As analysis in our tdoc, if NW cannot guarantee to use the same direction Tx beam, the UE will face additional interference and AGC issue. At the same time, the power imbalance between two CCs due to different Tx beam will also impact UE’s performance.Thus, similar as FR2 intra-band CA, the NW shall guarantee the same Tx beam from different CCs.On the other hand, the original purpose to add this assumption is to speed up UE’s activation procedure. But if NW can’t guarantee the same Tx beam, it means UE will most likely fail the SCell activation without timing adjustment for intra-band SCells. After that, UE had to search the timing again in real field.For option 3, we don’t think it can work. If different Tx beam direction, the power imbalance from different beams will impact UE’s performance. Only consider timing is not enough. |
| Huawei | We support option 2, which means we keep the current requirements and conditions. For option 1 or 1a, we understand the intention is to make common Tx beam a generic assumption for all RRM requirements. In our view, it is imposing unnecessary restrictions on the NW side. On UE side, for SCell activation, this assumption can help to reduce the delay, and that’s why we agreed to define requirements based on it, but at the same time it is also clarified that no activation requirement applies in case the assumption does not hold. For other requirements, we need to check the gain from having such an assumption and the consequence if it does not hold. At least based on our analysis, most of the FR1 RRM requirements are defined without this assumption, so there is no need to extend it as a generic assumption.For option 3, we understand the condition on RTD is less stringent than common Tx beam, so we would like to have more time to check the feasibility from UE side. |
| Qualcomm | To Ericsson: Yes, we also think ‘received time difference’ is more appropriate.To MTK: We agree with your observation, but again the same beam doesn’t guarantee the same/similar level of reception power between two cells. What is the definition of beam here? Does it include EIRP for a given direction, i.e. two cell’s transmission power toward all theta/phi should be the same? In order to address your concern about AGC, which we believe is a valid point, we can also add a condition like ‘reception power difference < XdB’ similar to ‘reception time difference’.To Apple: If the question is “whether UE can detect if reception time different < CP better than same-beam detection”, yes we think so because time/freq-tracking loop and/or channel estimator will tell reception time and power difference between cells. |
| MTK | To Huawei,From our understanding, if NW can guarantee the assumption for SCell activation, it implies NW’s behavior is to align the Tx beam direction between each CCs. And NW won’t only align the Tx beam in SCell activation procedure and random the Tx beam in other procedures. That doesn’t make sense.On the other hand, if the assumption is only used in SCell activation, UE will have a strong concern on whether UE can have such assumption in real field. In this way, we suggest not to speed up the SCell activation in this scenario and follow the same logic in R15 just requires UE to execute cell search in this scenario to avoid additional design just for passing the test. To QC,We understand your concern on how to define the same beam direction. We think the similar wording like intra-band FR2 is fine. We think our proposal try to solve this issue in a general way.At the same time, we can compromise on your proposal with the condition ‘reception power difference < XdB’.  |
| ZTE | We support option 2. Option 1 would put unnecessary strong restrictions on NW side if it is a generic assumption.  |
| Nokia | Support Option 2.The extension to other scenarios needs to be further discussed probably in RF sessions. We can hold the assumption in multiple SCell activation scenario in Rel16.For Option1, we have agreed no requirements apply if the condition cannot be met. We can stick to current understanding and do not enforce restriction to network configuration. For Option 3, we are not sure if the MRTD less than one CP is equivalent to the common SSB Tx beams. While MRTD has been defined for intra-band CA, common SSB Tx beams seems to be another separate condition. Some clarification would be good why they are the same.  |

**Issue 2-2-1: Extend the assumption in FR1 multiple SCells activation to single FR1 SCell activation**

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| **Company** | **Comments** |
| Ericsson | We are fine with the proposal. |
| Apple | Fine, but it might be applied from R16 and afterward. |
| MTK | We think this is the similar issue as 2-1. At the same time, single SCell activation was already implemented in legacy UE without this assumption. We don’t support to change the design for current stage. |
| Huawei | Support the proposal. To Apple and MTK, our intention is apply the requirement from Rel-16 onwards. |
| Qualcomm | Want to discuss it further once sub-topic 2-1 is settled. |
| ZTE | We support the proposal. Meanwhile we think this is similar to SCell without SSB and the principle can be applied to SCell without SSB. |
| Nokia | Support the proposal. If this is assumed in multiple SCells, it can be applied to single SCell activation. |

**Issue 2-2-2: Requirement applicability on the other being-activated SCells during the FR1 multiple SCells activation**

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| **Company** | **Comments** |
| Ericsson | We are fine with the proposal. In case one of the SCells to-be-activated by the MAC-CE command qualifies for “no requirements”, this applies to all SCells activated by the same command. |
| Apple | Agree with Huawei. |
| MTK | The logic here is if NW cannot guarantee the same Tx beam direction, it implies that there are no requirements for all the cases once any one of the FR1 intra-band SCell being activated. Before discussing this condition, we shall have some agreements on NW’s assumption in FR1. |
| Huawei | Support the proposal.  |
| Qualcomm | Agree to the proposal in principle but there is a pending issue somewhat related to this, sub-topic 2-1. We’re open to further discussion once sub-topic 2-1 is settled. |
| ZTE | Generally it is fine. We need to make clear when there is no requirement for one of the FR1 unknown SCell, |
| Nokia | For multiple SCell activation, the delay requirement is defined for each concerned SCell considering the other SCells being activated in parallel. If no requirement applies for one SCell due to different SSB Tx beams, the network may still possibly derive the requirement based on some assumptions. The UE and network understanding on the SSB Tx beams needs to be clarified. |

**Issue 2-2-3: Condition of SMTC configuration to apply multiple SCell activation requirement**

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| **Company** | **Comments** |
| Ericsson | This might be unnecessarily limiting. Should be enough that they overlap occasionally.  |
| Apple | Agree with Huawei’s observation, and we think both the SMTC offset and periodicity shall be same for all SCells activated by the same MAC CE in the multiple SCell activation requirement. |
| MTK | Agree with this proposal. |
| Huawei | We agree with Apple’s proposal above.To Ericsson, if SMTC for the two to-be-activated SCells overlap occasionally like in the figure, the RF re-tuning for SCell2 could be earlier than its SMTC, so the interruption caused by SCell2 to another serving cell in the same band as SCell2 would be longer than just SMTC duration.   |
| Qualcomm | Agree with the proposal and Apples comment. |
| Nokia | We may not fully understand the problem here. But there is no interruption on SCell1 as long as RF retuning of SCell2 does not collide with SMTC in SCell1. The condition of aligning the SMTC seems to be a bit too restrictive.  |

### 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** |
| R4-2015772 (Huawei CR) | Ericsson: Depends on outcome of first round discussion. Some conditions seem unnecessarily limiting at this point. |
| Apple: Same comment as to issue 2-2-3. |
| MTK: Depends on the further discussion. |
| Qualcomm: Pending issue |
| R4-2016019 (Ericsson CR) | Apple: fine. |
| MTK: It’s fine. |
| Huawei: OK |
| Qualcomm: Okay |
| R4-2016583(Qualcomm CR) | Ericsson: In general OK. Please check whether it should be MRTD or just ‘receive time difference’. |
| Apple: same comment as to issue 2-1 |
| MTK: Don’t agree on this update. MRTD can only guarantee the timing between CCs, but cannot guarantee the Tx beam direction from different CCs which will result in power imbalance in receiver. |
| Huawei: Depends on Issue 2-1 |

## Summary for 1st round

### Open issues

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

|  |  |
| --- | --- |
|  | **Status summary**  |
| **Issue 2-1: Tx beam assumption of FR1 intra-band contiguous CA** | *Tentative agreements:*No tentative agreement in 1st round. Based on the 1st round discussion, 2 companies supported option 1/1a, 3 companies supported option 2, and 2 companies supported option 3. Moderator added one more option 3a based on the 1st round discussion.*Candidate options:** Option 1 (MTK): The network should guarantee the transmitted signals from Scells have the same downlink spatial domain transmission filter on one OFDM symbol in intra-band FR1.
* Option 1a (Apple): The network should guarantee the transmitted signals from Scells have the same downlink spatial domain transmission filter on one OFDM symbol in intra-band contiguous FR1.
* Option 2 (Huawei, ZTE, Nokia): Common Tx beam for FR1 intra-band contiguous CA should not be taken as a generic assumption for all RRM requirements
* Option 3 (Qualcomm, Ericsson): RAN4 to revisit one of conditions for multiple SCell activation requirement for FR1 contiguous CA, and update it as follows:
	+ Replace “its SSB DL Tx beam is same as the corresponding SSB DL Tx beam at the same SSB position of contiguous FR1 known cell or contiguous FR1 active serving cell” with “its MRTD with contiguous FR1 known cell or contiguous FR1 active serving cell is smaller than or equal to CP duration with respect to the to-be-activated SCell’s SSB numerology”
	+ Replace “its SSB DL Tx beam is different as the corresponding SSB DL Tx beam at the same SSB position of contiguous FR1 known cell or contiguous FR1 active serving cell” with “its MRTD with contiguous FR1 known cell or contiguous FR1 active serving cell is larger than CP duration with respect to the to-be-activated SCell’s SSB numerology”
* Option 3a (MTK, Apple, QC): RAN4 to revisit one of conditions for multiple SCell activation requirement for FR1 contiguous CA, and update it as follows:
	+ Replace “its SSB DL Tx beam is same as the corresponding SSB DL Tx beam at the same SSB position of contiguous FR1 known cell or contiguous FR1 active serving cell” with “its RTD with contiguous FR1 known cell or contiguous FR1 active serving cell is smaller than or equal to CP duration with respect to the to-be-activated SCell’s SSB numerology and its reception power difference with contiguous FR1 known cell or contiguous FR1 active serving cell is smaller than or equal to XdB”, X is FFS.
	+ Replace “its SSB DL Tx beam is different as the corresponding SSB DL Tx beam at the same SSB position of contiguous FR1 known cell or contiguous FR1 active serving cell” with “its RTD with contiguous FR1 known cell or contiguous FR1 active serving cell is larger than CP duration with respect to the to-be-activated SCell’s SSB numerology or its reception power difference with contiguous FR1 known cell or contiguous FR1 active serving cell is larger than XdB”, X is FFS.

*Recommendations for 2nd round:*Continue discussion in the 2nd round and the agreement will be captured in the WF. |
| **Issue 2-2-1: Extend the assumption in FR1 multiple SCells activation to single FR1 SCell activation** | *Tentative agreements:*No tentative agreement in 1st round. Based on the 1st round discussion, 5 companies supported option 1, and 2 companies supported option 2.*Candidate options:** Option 1 (HW, Ericsson, Apple, ZTE, Nokia):
	+ Extend the UE requirement (to skip cell detection for unknown FR1 SCell that is intra-band contiguous to active serving cell) to single SCell activation, from Rel-16 onwards.
* Option 2 (MTK, QC):
	+ FFS on option 1.

*Recommendations for 2nd round:*Continue discussion in the 2nd round and the agreement will be captured in the WF. |
| **Issue 2-2-2: Requirement applicability on the other being-activated SCells during the FR1 multiple SCells activation** | *Tentative agreements:*No tentative agreement in 1st round. Based on the 1st round discussion, 5 companies supported option 1, and 2 companies supported option 2.*Candidate options:** Option 1 (Huawei, Ericsson, Apple, QC, ZTE):
	+ No requirement applies for other being-activated SCells, if no requirements apply for any of the FR1 unknown SCell activated with the same MAC CE

Note: Moderator reworded the proposal by adding “being-activated”.* Option 2 (MTK, Nokia):
	+ FFS on option 1.

*Recommendations for 2nd round:*Continue discussion in the 2nd round and the agreement will be captured in the WF. |
| **Issue 2-2-3: Condition of SMTC configuration to apply multiple SCell activation requirement** | *Tentative agreements:*No tentative agreement in 1st round. Based on the 1st round discussion, 4 companies supported option 1, and 2 companies supported option 2. Moderator revise the option 1 based on the 1st round discussion.*Candidate options:** Option 1 (Huawei, Apple, MTK, QC):
	+ Multiple SCell activation requirements apply provided that SMTC offset and periodicity is same for all SCells activated by the same MAC CE
* Option 2 (Ericsson, Nokia):
	+ Disagree with option 1.

*Recommendations for 2nd round:*Continue discussion in the 2nd round and the agreement will be captured in the WF. |

*Suggestion on WF/LS assignment*

|  |  |  |
| --- | --- | --- |
|  | **WF/LS t-doc Title**  | **Assigned Company,****WF or LS lead** |
| #1 | WF on R16 RRM enhancement part 3 – Multiple SCell activation, UE specific CBW change and feature list 9-8/9-9/9-10 | Apple |

### CRs/TPs

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

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation**  |
| R4-2015772 (Huawei CR) | *To be revised* |
| R4-2016019 (Ericsson CR) | *Agreeable* |
| R4-2016583(Qualcomm CR) | *To be revised* |

## Discussion on 2nd round (if applicable)

**Issue 2-1: Tx beam assumption of FR1 intra-band contiguous CA**

|  |  |
| --- | --- |
| **Company** | **Comments** |
|  |  |

**Issue 2-2-1: Extend the assumption in FR1 multiple SCells activation to single FR1 SCell activation**

|  |  |
| --- | --- |
| **Company** | **Comments** |
|  |  |

**Issue 2-2-2: Requirement applicability on the other being-activated SCells during the FR1 multiple SCells activation**

|  |  |
| --- | --- |
| **Company** | **Comments** |
|  |  |

**Issue 2-2-3: Condition of SMTC configuration to apply multiple SCell activation requirement**

|  |  |
| --- | --- |
| **Company** | **Comments** |
|  |  |

## Summary on 2nd round (if applicable)

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

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

# Topic #3: Inter-frequency measurements without MG miantenance (7.13.1.6)

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

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2014364 | MediaTek inc. | Clarify that “if UE supports *interFrequencyMeas-NoGap-r16,* for inter-frequency measurement with no measurement gap, when all of the SMTC occasions of this inter-frequency measurement object are overlapped by the measurement gap, UE should follow the requirement in clause 9.3.4” |
| R4-2014861 | Apple | Editorial CR. |
| R4-2015496 | Huawei, HiSilicon | The power imbalance between serving frequency layer and inter-frequency layer on which UE performs without gap shall be within [6]dB. |

## Open issues summary

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

### Sub-topic 3-1 Power imbalance condition for inter-frequency without MG

*Sub-topic description:*

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

**Issue 3-1: Power imbalance condition for inter-frequency without MG**

* Option 1 (Huawei, QC): The power imbalance between serving frequency layer and inter-frequency layer on which UE performs without gap shall be within [6]dB
* Option 2 (MTK, Intel): In the test case of inter-frequency measurement without MG, the power imbalance between serving frequency layer and inter-frequency layer on which UE performs without gap shall be within [6]dB.
* Option 3 (Ericsson, Apple, ZTE): such power imbalance limitation in option 1 is not needed.
* Recommended WF
	+ Continue discussion in the 2nd round and the agreement will be captured in the WF or Huawei’s CR

## Companies views’ collection for 1st round

### Open issues

**Issue 3-1: Power imbalance condition for inter-frequency without MG**

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Ericsson | We do not agree to this proposal. Firstly, the condition cannot be fully controlled by the network. Secondly, it seems to be based on a RF architecture with highly limited capability. Hence if a UE cannot use separate receiver chains for the CCs, or cannot receive serving layer and inter-frequency layer without sensitivity issues, the UE shall carry out measurements in conventional measurement gaps instead and not indicate a capability of measuring inter-frequency neighbour cells without measurement gaps.  |
| Apple | We have Io side condition and SINR side condition already to apply the requirement, but we don’t understand why we still needs this power imbalance limitation. |
| CMCC | Need more justification on the power imbalance limitation.  |
| MTK | It seems that we do not have side conditions specified for intra-freq. measurement neither. More discussion is needed. However, we think that it is fine to apply this setting in the test case.  |
| Huawei | The motivation to introduce the power restriction is to guarantee the inter-frequency measurement performance. In legacy, UE uses gap to perform inter-frequency measurement. That is UE retune to another frequency to set an appropriate AGC gain for measurement based on the received SSB power. For inter-frequency measurement without gap, the AGC for serving PDSCH is not always suitable for SSB measurement if the SSB power is extreme higher than PDSCH. |
| QC | Agree with the proposal |
| ZTE | We don’t think the statement that power imbalance between serving frequency layer and inter-frequency layer is correct. What UE can see is power imbalance between two/multiple CCs (or two cells). There are many cells on a frequency layer and it is not necessary to restrict the power imbalance for all the cells on a frequency layer for a UE has some limitation on implementation. |
| Intel | We are Ok to apply this setting in the test case |

### CRs/TPs comments collection

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

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| R4-2014364 (MTK CR) | Ericsson: OK |
| Apple: fine |
|  |
| R4-2014861 (Apple CR) | Ericsson: OK. |
| Company B |
|  |
| R4-2015496 (Huawei CR) | Ericsson: We cannot agree to this limitation. |
| Apple: same comment as to issue 3-1 |
| CMCC: Need more justification |
| MTK: It seems that we do not have side conditions specified for intra-freq. measurement neither. More discussion is needed. |

## Summary for 1st round

### Open issues

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

|  |  |
| --- | --- |
|  | **Status summary**  |
| **Issue 3-1: Power imbalance condition for inter-frequency without MG** | *Tentative agreements:*No tentative agreement in 1st round. Based on the 1st round discussion, 2 companies supported option 1, 2 companies supported option 2, and 3 companies supported option 3. Moderator added option 2 and 3 based on the 1st round discussion.*Candidate options:** Option 1 (Huawei, QC): The power imbalance between serving frequency layer and inter-frequency layer on which UE performs without gap shall be within [6]dB
* Option 2 (MTK, Intel): In the test case of inter-frequency measurement without MG, the power imbalance between serving frequency layer and inter-frequency layer on which UE performs without gap shall be within [6]dB.
* Option 3 (Ericsson, Apple, ZTE): such power imbalance limitation in option 1 is not needed.

*Recommendations for 2nd round:*Continue discussion in the 2nd round and the agreement will be captured in the WF or Huawei’s CR. |

*Suggestion on WF/LS assignment*

|  |  |  |
| --- | --- | --- |
|  | **WF/LS t-doc Title**  | **Assigned Company,****WF or LS lead** |
| #1 | WF on R16 RRM enhancement part 3 - Inter-frequency measurement without MG | CMCC |

### CRs/TPs

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

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation**  |
| R4-2014364 (MTK CR) | *Agreeable* |
| R4-2014861 (Apple CR) | *Agreeable* |
| R4-2015496 (Huawei CR) | *To be revised* |

## Discussion on 2nd round (if applicable)

**Issue 3-1: Power imbalance condition for inter-frequency without MG**

|  |  |
| --- | --- |
| **Company** | **Comments** |
|  |  |

## Summary on 2nd round (if applicable)

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

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

# Topic #4: UE-specific CBW change maintenance (7.13.1.6)

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

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2014277 | Apple | Specify the UE behavior for Tx/Rx during CBW change delay. |
|  |  |  |

## Open issues summary

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

### Sub-topic 4-1 UE behavior for Tx/Rx during CBW change delay

*Sub-topic description:*

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

**Issue 4-1: UE behavior for Tx/Rx during CBW change delay**

* Proposal (Apple): The UE is not required to transmit UL signals or receive DL signals during the time defined by $\frac{T\_{RRCprocessingDelay}+T\_{CBWchangeDelayRRC}}{NR Slot length}$ on the cell where UE-specific CBW change occurs.
* Recommended WF
	+ TBA

## Companies views’ collection for 1st round

### Open issues

**Issue 4-1: UE behavior for Tx/Rx during CBW change delay**

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Ericsson | We are OK with the proposal. |
| Apple | We can revise it if we have new conclusion in RRC based BWP switching requirement. |
| MTK | We are OK with the proposal. |
| Huawei | We are fine with the proposal. |
| QC | Support the proposal. |
| Nokia | Proposal is fine, The time should be “TRRCprocessingDelay + TCBWchangeDelayRRC”, not in slot unit.[Apple]: Yes, we can revise this. Thanks! |

### CRs/TPs comments collection

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

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| R4-2014277 (Apple CR) | Ericsson: OK. |
| Huawei: OK |
| Nokia: CR need to be revised, the time should be “TRRCprocessingDelay + TCBWchangeDelayRRC” in this change since the time unit is not in slot. |
| YYY | Company A |
| Company B |
|  |

## Summary for 1st round

### Open issues

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

|  |  |
| --- | --- |
|  | **Status summary**  |
| **Issue 4-1: UE behavior for Tx/Rx during CBW change delay** | *Tentative agreements:*The UE is not required to transmit UL signals or receive DL signals during the time defined by $T\_{RRCprocessingDelay}+T\_{CBWchangeDelayRRC} $on the cell where UE-specific CBW change occurs.*Candidate options:**Recommendations for 2nd round:*This issue is closed, and will capture the agreement in the CR. |

*Suggestion on WF/LS assignment*

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

### CRs/TPs

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

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation**  |
| R4-2014277 (Apple CR) | *To be revised. (to capture Nokia’s comment)* |

## Discussion on 2nd round (if applicable)

## Summary on 2nd round (if applicable)

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

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

# Topic #5: TCs of Multiple Scell activation/deactivation (7.13.2.2.2)

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

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2014276 | Apple | * TC 1: EN-DC of LTE+FR1 NR without DRX with single MAC CE
	+ 2 FR1 unknown to-be-activated SCells, where
		- first FR1 unknown SCell is intra-band contiguous to active FR1 NR PSCell (meet the exception condition of N1 counting)
		- second FR1 unknown SCell is inter-band to active FR1 NR PSCell
 |
| R4-2014777 | Mediatek Inc. | * TC 3: NR-DC without DRX (test per-FR MG capable UE) with dual MAC CEs
	+ one inter-band FR1 unknown to-be-activated SCells + one FR2 unknown to-be-activated SCells with periodic CSI-RS for CSI reporting
 |
| R4-2015773 | Huawei, HiSilicon | * TC 2: 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
	+ 1 FR2 known to-be-activated SCell and 1 FR2 unknown to-be-activated SCell
	+ Both to-be-activated SCells are configured with periodic CSI-RS for CSI reporting
 |

## Open issues summary

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

### Sub-topic 5-1

*Sub-topic description:*

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

## Companies views’ collection for 1st round

### Open issues

### CRs/TPs comments collection

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

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| R4-2014276 (Apple CR) | Ericsson: May want to check the wording. It seems plural form has been a bit overused. Table referred to as Tables, etc. |
| MTK:Table A. 4.5.3.4.1-2: In T1, cell 3 and cell 4 are power off. |
|  |
| R4-2014777(MTK CR) | Ericsson: May want to check the wording. It seems plural form has been a bit overused. |
| Apple: Need to clarify the PCell and FR1 SCell are inter-band CA in this test case. |
| To Ericsson:Could you help to further clarify the detail parts need to update?To Apple: Thank you for Apple’s comments. We’ll update it in the CR. |
| R4-2015773(Huawei CR) | Ericsson: OK. |
| Apple: fine |
| MTK: 1. T1=7s

Why we needs so long duration for T1. 100ms was agreed in single SCell activation1. 3s for UE power class 2/3/4 or 4s for UE power class 1

It seems not differentiate power class in Multiple SCell activation core requirement1. RRM measurement reporting is configured for SCell1 but not for SCell2.

It should be SCell 3 and SCell 41. Table A. 4.5.3.1.1-3 Cell specific test parameters

In T1, no SSB and other channel configuration will be defined for Cell 4.1. Table A.5.5.3.Y.1-4: OTA related test parameters

It should be cell 3, and cell 4. And cell4 shall be silent in T1.1. ‘k’ value shall be slot unit or transfer slot to ms
2. If UE support per-FR gap, UE is not allowed to cause interruption during T2 and T3 to E-UTRA PCell or PSCell. ->

 If UE support per-FR gap, UE is not allowed to cause interruption during T2 and T3 to E-UTRA PCell and NR PSCell. |
| To MTK:1. In this test case, one SCell is known, so T1 should be long enough to make sure UE can measure and report the SCell. 7s duration is reused from single SCell activation in A.6.5.3.1.1.
2. The known condition for multiple SCell activation is defined as “The condition of known SCell in FR1 or FR2 is defined in clause 8.3.2”. In 8.3.2, the condition is different for different power classes “During the period equal to 4s for UE supporting power class1 and 3s for UE supporting power class 2/3/4 before UE receives the last activation command for PDCCH TCI, PDSCH TCI (when applicable) and semi-persistent CSI-RS for CQI reporting (when applicable)”
3. The cell indexing in the CR is that Cell3=SCell1, Cell4=SCell2, so we understand SCell1 and SCell2 are correct.
4. OK, we will mute SSB for Cell 4 in T1 in the revised version.
5. OK, we will change SS-RSRP for Cell 4 in T1 to N/A in the revised version.
6. OK, we will change the unit for k to slot in the revised version
7. We understand “or” is correct, since the sentence is saying “UE is not allowed to …”.
 |
| To HW,Thank you for your feedback. We’re fine with your explanation on comments 1,2,3,7. |

## Summary for 1st round

### Open issues

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

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

*Suggestion on WF/LS assignment*

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

### CRs/TPs

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

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation**  |
| R4-2014276 (Apple CR) | *to be revised* |
| R4-2014777(MTK CR) | *to be revised* |
| R4-2015773(Huawei CR) | *to be revised* |

## Discussion on 2nd round (if applicable)

## Summary on 2nd round (if applicable)

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

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

# Topic #6: TCs of Inter-frequency measurement requirement without MG (7.13.2.2.5)

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

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2014226 | Apple | Introduce RRM test case for inter-frequency measurement without gap: SA event triggered reporting tests for FR1 when DRX is used  |
| R4-2014365 | MediaTek inc. | Define test case for SA event triggered reporting tests for FR2 without gap when DRX is used |
| R4-2014645 | Qualcomm, Inc. | Observation 1: There are valid SSB configurations under 10MHz channel BW with 15kHz SCS, 40MHz channel BW with 30kHz SCS, and 100MHz channel BW with 120kHz SCS for inter-frequency without measurement gap scenarios.Proposal 1: Test coverage for inter-frequency measurement without MG is as listed in Table 2-1.

|  |  |  |
| --- | --- | --- |
| RAT\FR | FR1 | FR2 |
| EN-DC | No DRx, without SSB index reading | No DRx, without SSB index reading |
| NR-SA | DRx, without SSB index reading | DRx, without SSB index reading |

Proposal 2: Do not configure gap in inter-frequency measurement without MG tests. |
| R4-2014731 | CMCC | Proposal 1: It is proposed that RAN4 agreed on the following TC list for R16 inter-frequency measurement without MG.

|  |  |
| --- | --- |
| **TC** | Company |
| 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 |
| Note: existing TCs only consider test cases without SSB time index detection |

Proposal 2: It is proposed that RAN4 further discuss whether to introduce test case with SSB time index detection. The proposed alternatives are:* Alt1: TC1 FDD is without SSB time index detection, TC2 FDD is with SSB time index detection
* Other alternatives are not precluded.
 |
| R4-2014732 | CMCC | Define test case for SA event triggered reporting tests for FR1 without gap when DRX is not used |
| R4-2015497 | Huawei, HiSilicon | Specifying the inter-frequency measurements SA event triggered reporting tests for FR2 without gap when DRX is not used. |

## Open issues summary

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

### Sub-topic 6-1 TC list for inter-frequency measurement requirement without MG

*Sub-topic description:*

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

**Issue 6-1: TC list for inter-frequency measurement requirement without MG**

* Proposal:
	+ Option 1 (Qualcomm):
		- Test coverage for inter-frequency measurement without MG is as listed in gollowing table.

|  |  |  |
| --- | --- | --- |
| RAT\FR | FR1 | FR2 |
| EN-DC | No DRx, without SSB index reading | No DRx, without SSB index reading |
| NR-SA | DRx, without SSB index reading | DRx, without SSB index reading |

* + Option 2 (CMCC):
		- It is proposed that RAN4 agreed on the following TC list for R16 inter-frequency measurement without MG.

|  |  |
| --- | --- |
| **TC** | Company |
| 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 |
| Note: existing TCs only consider test cases without SSB time index detection |

* Recommended WF
	+ Agree on option 2

### Sub-topic 6-2 TC configurations for inter-frequency measurement without MG

*Sub-topic description:*

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

**Issue 6-2-1: MG configuration in TCs**

* Proposal (Qualcomm):
	+ Do not configure gap in inter-frequency measurement without MG tests.
* Recommended WF
	+ Tentative agreement: Do not configure gap in inter-frequency measurement without MG tests.

**Issue 6-2-2: SSB time index detection in TCs**

* Option 1 (CMCC, Ericsson, Huawei, QC)
	+ It is proposed that RAN4 further discuss whether to introduce test case with SSB time index detection. The proposed alternatives are:
		- Alt1: TC1 FDD is without SSB time index detection, TC2 FDD is with SSB time index detection
		- Other alternatives are not precluded.
* Option 2 (Apple, MTK)
	+ - Prefer to not test SSB index detection for inter-frequency measurement without MG test cases.
* Recommended WF
	+ Continue discussion in the 2nd round and the agreement will be captured in the WF

**Issue 6-2-3: DRX cycle setup in TCs**

In TC2 and TC4 of issue 6-1 TC list (option 2), how many DRX cycles shall be configured in each test case:

* Option 1: TC2 tests one DRX cycle only and TC4 tests one DRX cycle only. The DRX cycle in TC2 and TC4 can be different.
* Option 2: TC2 tests two DRX cycles and TC4 tests two DRX cycles.
* Recommended WF
	+ Continue discussion in the 2nd round and the agreement will be captured in the WF

## Companies views’ collection for 1st round

### Open issues

**Issue 6-1: TC list for inter-frequency measurement requirement without MG**

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Ericsson | We are fine with Option 2. |
| Apple | Option 1 is preferred since it has larger test coverage. |
| CMCC | Support option 2. In addition, we are OK to include additional EN-DC scenario if companies think it is necessary. |
| QC | We can support CMCC proposal |
| MTK | No strong view. Prefer option 2. |

**Issue 6-2-1: MG configuration in TCs**

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Ericsson | We are fine with the proposal.  |
| Apple | We are fine with the proposal. |
| CMCC | OK with the proposal |
| Huawei | Fine with the proposal |
| QC | Our proposal, and it aligns to all CRs proposed by companies. |
| MTK | OK with the proposal |

**Issue 6-2-2: SSB time index detection in TCs**

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Ericsson | We are fine with the proposal. |
| Apple | We prefer not to test SSB index detection time. The fundamental test point is to verify whether UE can perform measurement without gap. This can be verified during PSS/SSS detection procedure, even in async FDD scenario. On the other hand, SSB index detection time in FDD scenario has already been verified in existing test cases. |
| CMCC | Alt1: TC1 FDD is without SSB time index detection, TC2 FDD is with SSB time index detectionAlt 1 does not increase the test burden and has better test coverage, we prefer this option. |
| Huawei | We are fine with Alt1. |
| QC | We support Alt1.  |
| MTK | We have similar comment with Apple. Test cases with SSB time index detection has already been verified in test cases for RRM measurement. We prefer not to introduce test case with SSB time index detection here. |

### CRs/TPs comments collection

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

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| R4-2014226 (Apple CR) | Ericsson: It does not seem clearly specified that the SSB for the inter-frequency cell is within the active BWP. |
| Apple: per-UE gap and per-FR gap is mistakenly mentioned in test requirements. |
| QC: There are two tests with different DRx cycles, but from inter-frequency measurement without gap functionality point of view, no difference with different DRx cycles. Measurement requirements for different DRx cycles are tested in both inter-frequency measurement with gap and intra-frequency measurement without gap test cases, here the goal is to test the “gapless inter-frequency measurement” part, hence only one test with one of the proposed DRx cycle is needed. |
| MTK: Similar comment with Ericsson. |
| R4-2014365 (MTK CR) | Ericsson: Seems OK. |
| Apple: suggest to explicitly mention that SSB in cell 1 and cell 2 are allocated in different RBs. |
| QC: Same comment as R4-2014226 |
| MTK: We would like to check whether Apple is o.k. with the following description. “There are two cells in the test, where PCell (Cell 1) is on NR RF channel 1 and an FR2 neighbour cell (Cell 2) is on NR RF channel 2. The SSB of Cell 2 is completely within UE’s active BWP BW.” |
| R4-2014732 (CMCC CR) |  Ericsson: It does not seem clearly specified that the SSB for the inter-frequency cell is within the active BWP. |
| Apple: suggest to explicitly mention that SSB from cell 2 is confined within UE active BWP but has different RB allocation. Editorial comment: Please use the revision mark. |
| MTK: Similar comment with Ericsson. |
| R4-2015497(Huawei CR) |  Ericsson: It does not seem clearly specified that the SSB for the inter-frequency cell is within the active BWP. |
| Apple: suggest to explicitly mention that SSB from cell 2 is confined within UE active BWP but has different RB allocation. |
| MTK: Similar comment with 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.*

|  |  |
| --- | --- |
|  | **Status summary**  |
| **Issue 6-1: TC list for inter-frequency measurement requirement without MG** | *Tentative agreements:** It is proposed that RAN4 agreed on the following TC list for R16 inter-frequency measurement without MG.

|  |  |
| --- | --- |
| **TC** | Company |
| 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 |
| Note: existing TCs only consider test cases without SSB time index detection |

*Candidate options:**Recommendations for 2nd round:*This issue is closed. Will capture the agreement in WF. |
| **Issue 6-2-1: MG configuration in TCs** | *Tentative agreements:** Do not configure gap in inter-frequency measurement without MG tests.

*Candidate options:**Recommendations for 2nd round:*This issue is closed. Will capture the agreement in WF. |
| **Issue 6-2-2: SSB time index detection in TCs** | *Tentative agreements:*No tentative agreement in 1st round. Based on the 1st round discussion, 4 companies supported option 1, and 2 companies supported option 2. Moderator added option 2 based on the 1st round discussion.*Candidate options:** Option 1 (CMCC, Ericsson, Huawei, QC)
	+ It is proposed that RAN4 further discuss whether to introduce test case with SSB time index detection. The proposed alternatives are:
		- Alt1: TC1 FDD is without SSB time index detection, TC2 FDD is with SSB time index detection
		- Other alternatives are not precluded.
* Option 2 (Apple, MTK)
	+ - Prefer to not test SSB index detection for inter-frequency measurement without MG test cases.

*Recommendations for 2nd round:*Continue discussion in the 2nd round and the agreement will be captured in the WF. |
| **Issue 6-2-3: DRX cycle setup in TCs** | *Tentative agreements:*This is new issue commented by Qualcomm. No tentative agreement in 1st round. *Candidate options:** Option 1: TC2 tests one DRX cycle only and TC4 tests one DRX cycle only. The DRX cycle in TC2 and TC4 can be different.
* Option 2: TC2 tests two DRX cycles and TC4 tests two DRX cycles.

*Recommendations for 2nd round:*Continue discussion in the 2nd round and the agreement will be captured in the WF. |

*Suggestion on WF/LS assignment*

|  |  |  |
| --- | --- | --- |
|  | **WF/LS t-doc Title**  | **Assigned Company,****WF or LS lead** |
| #1 | WF on R16 RRM enhancement part 3 - Inter-frequency measurement without MG (To Andrey: this WF is same one as in section 3.4) | CMCC |

### CRs/TPs

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

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation**  |
| R4-2014226 (Apple CR) | *To be revised* |
| R4-2014365 (MTK CR) | *To be revised* |
| R4-2014732 (CMCC CR) | *To be revised* |
| R4-2015497(Huawei CR) | *To be revised* |

## Discussion on 2nd round (if applicable)

**Issue 6-2-2: SSB time index detection in TCs**

|  |  |
| --- | --- |
| **Company** | **Comments** |
|  |  |

**Issue 6-2-3: DRX cycle setup in TCs**

|  |  |
| --- | --- |
| **Company** | **Comments** |
|  |  |

## Summary on 2nd round (if applicable)

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

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

# Topic #7: TCs of UE-specific CBW change (7.13.2.2.7)

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

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2014278 | Apple |

|  |  |
| --- | --- |
| **Test case list for UE specific CBW change** | **TC parameters** |
| TC1: UE specific CBW change on FR1 NR PSCell with non-DRX in synchronous EN- DC (A.4.5.x) | * *offsetToCarrier* is changed for TC of UE specific CBW change, while *carrierBandwidth* is unchanged in this TC (same as RF channel BW defined in each test)*.*
* Reuse the parameters as much as possible from TC of RRC based BWP switching except the BWP switching parameters.
 |
| TC2: UE specific CBW change on FR2 NR PSCell with non-DRX in synchronous EN- DC (A.5.5.x) |
| TC3: UE specific CBW change on FR1 NR PCell with non-DRX in NR SA (A.6.5.x) |
| TC4: UE specific CBW change on FR2 NR PCell with non-DRX in NR SA (A.7.5.x)                                |

Proposal: RAN4 agrees on the above TC list. |
| R4-2014279 | Apple | Add the test case of UE specific CBW change on FR1 NR PSCell with non-DRX in synchronous EN-DC into TS38.133. |
| R4-2015302 | NEC | Addition of TCs for UE specific CBW change on FR2 NR PCell in NR SA |
| R4-2015777 | Huawei, HiSilicon | Introduce TC for UE specific CBW change on FR2 NR PSCell in EN-DC. |
| R4-2016168 | Ericsson | In the test the UE-specific CBW change is realized by changing only the *offsetToCarrier* without changing *carrierBandwidth* or any other BW related parameter. This allows the reuse of most of the parameters in the current test case on RRC based active BWP switching in A.6.5.6.2.1. |
| R4-2016169 | Ericsson | Test case is defined to verify delay requirement on UE specific CBW change on FR1 NR PCell in NR SA scenario. |

## Open issues summary

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

### Sub-topic 7-1 TC list for UE-specific CBW change

*Sub-topic description:*

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

**Issue 7-1-1: TC list for UE-specific CBW change**

* Proposal (Apple):

|  |  |
| --- | --- |
| **Test case list for UE specific CBW change** | **TC parameters** |
| TC1: UE specific CBW change on FR1 NR PSCell with non-DRX in synchronous EN- DC (A.4.5.x) | * *offsetToCarrier* is changed for TC of UE specific CBW change, while *carrierBandwidth* is unchanged in this TC (same as RF channel BW defined in each test)*.*
* Reuse the parameters as much as possible from TC of RRC based BWP switching except the BWP switching parameters.
 |
| TC2: UE specific CBW change on FR2 NR PSCell with non-DRX in synchronous EN- DC (A.5.5.x) |
| TC3: UE specific CBW change on FR1 NR PCell with non-DRX in NR SA (A.6.5.x) |
| TC4: UE specific CBW change on FR2 NR PCell with non-DRX in NR SA (A.7.5.x)                                |

* Recommended WF
	+ TBA

**Issue 7-1-2: new section for CBW configuration**

* Proposal (NEC): add the following generic section into TS38.133

Table A.3.x.1-1: DL CBW patterns for UE specific CBW configuration

|  |  |  |
| --- | --- | --- |
| BWP Parameters | Unit | Values |
| Reference CBW |  | DLCBW.1.1 | DLCBW.1.2 |
| OffsetToCarrier | RB | 0 | RBx Note 1 |
| carrierBandwidth | RB | Same as RF channel defined in each test | Same as RF channel defined in each test |
| Note 1: RBx is offset in frequency domain between Point A (lowest subcarrier of common RB 0) and the lowest usable subcarrier on this carrier. Note that RBx has to be within the CBW of BS. |

* Recommended WF
	+ TBA

## Companies views’ collection for 1st round

### Open issues

**Issue 7-1-1: TC list for UE-specific CBW change**

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Ericsson | We are fine with the proposal. It is better to align some of the parameters in different tests e.g. same initial UL and DL BWPs etc. See comments on different tests below. |
| Apple | Support |
| Huawei | Support  |
| NEC | Support |
| QC | Agree to the proposal |
| Nokia | We are fine with the proposal.  |

**Issue 7-1-2: new section for CBW configuration**

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Ericsson | We are in general fine with the proposal, but at least initial UL and DL BWPs need to be specified either in this table or each test case using the tabulated configurations. |
| Apple | Fine with NEC proposal |
| Huawei | We are fine with the proposal |
| NEC | We agree with Ericsson suggestion. Either approach is fine for us for adding initial UL and DL BWPs. |
| QC | Agree to the proposal |
| Nokia | We are fine with the proposal. |

### CRs/TPs comments collection

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

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| R4-2014279 (Apple CR) | Ericsson: In principle it looks fine. But active BWP-1 should be CBW-1. In test requirements NR slots should be added in denominator. |
| Apple: if NEC proposal agreed in issue 7-1-2, then CR needs revision. |
| NEC: Few non-technical comments regarding CR cover sheet. I think following cover sheet errors are there. 1) Category 2) proposed change affects and 3) CR form version.  |
| Nokia: Generally fine. The CR category should be “B” instead of “F”, and the time duration should be updated with slot unit. Suggest to have the similar conditions given before test starting between all CBW test cases. |
| R4-2015302 (NEC CR) | Ericsson: In principle it looks fine, but at least initial UL and DL BWPs need to be specified either in the pre-defined table in A.3.X or in each test case using the tabulated configurations. |
| Apple: fine |
| NEC: Following Ericsson suggestion, the CR needs revision. |
| Nokia: Missing BWP configuration. Suggest to have the similar conditions given before test starting between all CBW test cases. |
| R4-2015777 (Huawei CR) | Ericsson: In principle it looks fine. In test requirements NRs slots should be added in denominator. |
| Apple: fine. |
| Huawei: To Ericsson, we can update the test requirements in revised version. |
| NEC: couple of coversheet errors? CR form and other specs affected? |
| QC: Missing ms to slot conversion |
| Nokia: The time duration should be updated with slot unit. The description before Table A.5.5.X.1.1-1 as “The test equipment verifies the DL BWP switch time ……” is wrong, it should be updated to verify CBW feature. The same issue in test requirements which also is given as BWP switch delay. Suggest to have the similar conditions given before test starting between all CBW test cases. |
| R4-2016169 (Ericsson CR) | Apple: fine. |
| NEC: is Other specs affected is correct in cover sheet? |
| Nokia: OK. Same suggestion as other CBW test cases |

## Summary for 1st round

### Open issues

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

|  |  |
| --- | --- |
|  | **Status summary**  |
| **Issue 7-1-1: TC list for UE-specific CBW change** | *Tentative agreements:*

|  |  |
| --- | --- |
| **Test case list for UE specific CBW change** | **TC parameters** |
| TC1: UE specific CBW change on FR1 NR PSCell with non-DRX in synchronous EN- DC (A.4.5.x) | * *offsetToCarrier* is changed for TC of UE specific CBW change, while *carrierBandwidth* is unchanged in this TC (same as RF channel BW defined in each test)*.*
* Reuse the parameters as much as possible from TC of RRC based BWP switching except the BWP switching parameters.
 |
| TC2: UE specific CBW change on FR2 NR PSCell with non-DRX in synchronous EN- DC (A.5.5.x) |
| TC3: UE specific CBW change on FR1 NR PCell with non-DRX in NR SA (A.6.5.x) |
| TC4: UE specific CBW change on FR2 NR PCell with non-DRX in NR SA (A.7.5.x)                                |

*Candidate options:**Recommendations for 2nd round:*This issue is closed, and agreement will be captured in WF. |
| **Issue 7-1-2: new section for CBW configuration**  | *Tentative agreements:** add the following generic section into TS38.133

Table A.3.x.1-1: DL CBW patterns for UE specific CBW configuration

|  |  |  |
| --- | --- | --- |
| BWP Parameters | Unit | Values |
| Reference CBW |  | DLCBW.1.1 | DLCBW.1.2 |
| OffsetToCarrier | RB | 0 | RBx Note 1 |
| carrierBandwidth | RB | Same as RF channel defined in each test | Same as RF channel defined in each test |
| Note 1: RBx is offset in frequency domain between Point A (lowest subcarrier of common RB 0) and the lowest usable subcarrier on this carrier. Note that RBx has to be within the CBW of BS. |

Moderator suggestion: the UL/DL BWP configuration can be configured in each test based on A.3.9 in TS38.133*Candidate options:**Recommendations for 2nd round:*This issue is closed (unless companies have further comments on UL/DL BWP configuration solution), and agreement will be captured in WF. |

*Suggestion on WF/LS assignment*

|  |  |  |
| --- | --- | --- |
|  | **WF/LS t-doc Title**  | **Assigned Company,****WF or LS lead** |
| #1 | WF on R16 RRM enhancement part 3 – Multiple SCell activation, UE specific CBW change and feature list 9-8/9-9/9-10(To Andrey: this WF is same one as in section 2.4) | Apple |

### CRs/TPs

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

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation**  |
| R4-2014279 (Apple CR) | *To be revised* |
| R4-2015302 (NEC CR) | *To be revised* |
| R4-2015777 (Huawei CR) | *To be revised* |
| R4-2016169 (Ericsson CR) | *To be revised* |

## Discussion on 2nd round (if applicable)

## Summary on 2nd round (if applicable)

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

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

# Topic #8: TCs of Inter-band CA requirement for FR2 UE measurement capability of independent Rx beam (7.13.2.2.9)

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

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2015173 | Ericsson | Proposal 1 : Test case A.7.5.2.1 (Interruptions during measurements on deactivated NR SCC in FR2) may be directly applied for FR2+FR2 interband CA testingProposal 2 : Test case - Interruption duration if the PCell is not in the same band as the deactivated SCell and  SCell Activation and deactivation for FR1+FR2 inter-band with target SCell in FR2 may be reused for FR2 interband CA testingProposal 3 : Test case A.7.5.6.1.2 NR FR1- NR FR2 DL active BWP switch of PCell with non-DRX in SA FR2 may be reused for FR2 interband CA testingProposal 4 : The test case list for interband FR2+FR2 CA is

|  |  |
| --- | --- |
| Test 1 | SCell Activation and deactivation for FR2+FR2 inter-band |
| Test 2 | NR FR2- NR FR2 DL active BWP switch of PCell with non-DRX in SA |

 |
| R4-2015475 | Huawei, HiSilicon | Proposal 1: For SCell activation and deactivation delay requirements, it is suggested to introduce new test cases for FR2 inter-band CA scenario in Rel-16.Proposal 2: For SCell activation and deactivation delay test in FR2 inter-band CA, it is suggested that the test consists of three time period.* Before the test starts, the UE is connected to Cell 1 (PCell) on FR2 band 1.
* At the beginning of T1, the UE receives an RRC message to add Cell 2 as SCell on FR2 band 2. The time duration T1 is the preparation period for the test.
* At the beginning of T2, the UE receives a MAC message for SCell activation. During time duration T2, the SCell activation delay and interruptions to PCell need to be tested.
* At the beginning of T3, the UE receives a MAC message for SCell deactivation. During time duration T3, the SCell deactivation delay and interruptions to PCell need to be tested.
 |
| R4-2015476 | Huawei, HiSilicon | To introduce the SCell activation and deactication delay test for FR2 inter-band CA scenario |
| R4-2016577 | Qualcomm Incorporated | Proposal 1: RAN4 to introduce RRM test case(s) for IBM UEs supporting inter-band FR2 CA to verify if the UE meets RRM performance requirement(s) on both inter-bands when 2 AoAs are concurrently active from different angles, provided that* 2 AoAs are (pseudo) randomly selected and/or at least [X] degrees apart within a spherical coverage
	+ If any restriction is identified by RF session, it should be respected and possible test directions will be updated accordingly
* Both inter-band CCs transmit and configure reference signal(s) for independent beam management
* SSB on one band and CSI-RS and/or PDCCH/PDSCH on the other band can have different numerologies
* At least one RRM accuracy performance requirement should be met on both bands, and FFS on which RRM requirement
 |

## Open issues summary

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

### Sub-topic 8-1 TC list for inter-band CA requirement for FR2 UE measurement capability of independent Rx beam

*Sub-topic description:*

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

**Issue 8-1: TC list for inter-band CA requirement for FR2 UE measurement capability of independent Rx beam**

* Proposal:
	+ Option 1 (Ericsson, Apple, MTK): The test case list for interband FR2+FR2 CA is

|  |  |
| --- | --- |
| Test 1 | SCell Activation and deactivation for FR2+FR2 inter-band |
| Test 2 | NR FR2- NR FR2 DL active BWP switch of PCell with non-DRX in SA |

* + Option 2 (Huawei, Apple, Qualcomm, MTK, Intel): For SCell activation and deactivation delay requirements, it is suggested to introduce new test cases for FR2 inter-band CA scenario in Rel-16.
* Recommended WF
	+ Continue discussion in the 2nd round and the agreement will be captured in the WF.

### Sub-topic 8-2 TC configurations for inter-band CA requirement for FR2 UE measurement capability of independent Rx beam

**Issue 8-2: TC configurations for inter-band CA requirement for FR2 UE measurement capability of independent Rx beam**

* Proposal 1(Huawei, Ericsson, MTK, Nokia, Intel, Apple): For SCell activation and deactivation delay test in FR2 inter-band CA, it is suggested that the test consists of three time period. (add a note to clarify that bands 1 and 2 are inter-band CA operating bands in FR2 as specified in Table 5.2A.2-1 in TS38.101-2)
	+ Before the test starts, the UE is connected to Cell 1 (PCell) on FR2 band 1.
	+ At the beginning of T1, the UE receives an RRC message to add Cell 2 as SCell on FR2 band 2. The time duration T1 is the preparation period for the test.
	+ At the beginning of T2, the UE receives a MAC message for SCell activation. During time duration T2, the SCell activation delay and interruptions to PCell need to be tested.
	+ At the beginning of T3, the UE receives a MAC message for SCell deactivation. During time duration T3, the SCell deactivation delay and interruptions to PCell need to be tested.
* Proposal 2(QC): RAN4 to introduce RRM test case(s) for IBM UEs supporting inter-band FR2 CA to verify if the UE meets RRM performance requirement(s) on both inter-bands when 2 AoAs are concurrently active from different angles, provided that
	+ 2 AoAs are (pseudo) randomly selected and/or at least [X] degrees apart within a spherical coverage
		- If any restriction is identified by RF session, it should be respected and possible test directions will be updated accordingly
	+ Both inter-band CCs transmit and configure reference signal(s) for independent beam management
	+ SSB on one band and CSI-RS and/or PDCCH/PDSCH on the other band can have different numerologies
	+ At least one RRM accuracy performance requirement should be met on both bands, and FFS on which RRM requirement.
* Recommended WF
	+ Agree on proposal 1 and FFS on proposal 2.
	+ Moderator added some clarification in the proposal 1, i.e., “add a note to clarify that bands 1 and 2 are inter-band CA operating bands in FR2 as specified in Table 5.2A.2-1 in TS38.101-2”

## Companies views’ collection for 1st round

### Open issues

**Issue 8-1: TC list for inter-band CA requirement for FR2 UE measurement capability of independent Rx beam**

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Ericsson | We support the TC list in Option 1. |
| Apple | Fine with both options. |
| Huawei | We support option 2In the existing test for “NR FR2- NR FR2 DL active BWP switch of PCell with non-DRX in SA”, the two cells (PCell and SCell) can be configured as either FR2 intra-band CA or FR2 inter-band CA. Since the interruption requirements due to active BWP switch are same for both intra-band CA and inter-band CA. UE could choose one configuration for testing. |
| Qualcomm | Support Option 2. |
| MTK | Fine with both options. And agree with Huawei’s comment that UE can pass one of configurations. |
| Nokia | No strong view. Test cases needs to be introduced to test new core requirements. |
| Intel | Option 2 |

**Issue 8-2: TC configurations for inter-band CA requirement for FR2 UE measurement capability of independent Rx beam**

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Ericsson | We are fine with Proposal 1. We see merits with Proposal 2, too, but note that it goes a bit further than we do in legacy e.g. by checking accuracy in CA RRM test cases. The OTA accurcay margins are wide, so we prefer focusing on more ‘functional’ issues like SCell activation delay and interruptions.  |
| Apple | Comment to Huawei proposal: we shall use Low (n257/n258/n261) + High BC (n259/n260) in the TC configuration instead of band 1 and band 2.Comment to QC proposal: We think Setup 3 is sufficient. If only SCell activation and BWP switching TC is needed, the mixed numerology is not necessary to be configured in the TCs for simplicity. We think it’s not necessary to check the accuracy requirement in this test. |
| Huawei | We suggest to discuss the new test(s) for verifying the functional RRM requirements in FR2 inter-band CA scenario. As we mentioned in issue 8-1, new SCell activation delay test needs to be introduced for FR2 inter-band CA.To Apple: we can add a note to clarify that bands 1 and 2 are inter-band CA operating bands in FR2 as specified in Table 5.2A.2-1 in TS38.101-2. |
| Qualcomm | For the numerology, we are okay with the same numerology between inter-bands if there is no strong demand. For AoA setup, if we don’t’ have separate AoAs for the test, we wonder how RAN4 can tell UE meets the requirements by using independent beam management. And for OTA accuracy issue, it may be true for RF tests such as EIS, EIRP, etc. However for RRM test, we don’t need such a low reception power where accuracy issues arise. |
| MTK | Fine with Proposal 1 and agree with focusing on the functional tests. |
| Nokia | We can accept proposal 1. |
| Intel | We are OK with proposal 1. |

### CRs/TPs comments collection

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

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| **CR/TP number** | **Comments collection** |
| R4-2015476 (Huawei CR) | Ericsson: In principle it looks fine. A little more work may be needed for the requirements section though, as current formatting makes it a bit hard to read.  |
| Apple: same comment as to issue 8-2. |
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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**  |
| **Issue 8-1: TC list for inter-band CA requirement for FR2 UE measurement capability of independent Rx beam** | *Tentative agreements:*No tentative agreement in 1st round. Based on the 1st round discussion, 3 companies supported option 1, and 5 companies supported option 2. *Candidate options:** + Option 1 (Ericsson, Apple, MTK): The test case list for interband FR2+FR2 CA is

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| Test 1 | SCell Activation and deactivation for FR2+FR2 inter-band |
| Test 2 | NR FR2- NR FR2 DL active BWP switch of PCell with non-DRX in SA |

* + Option 2 (Huawei, Apple, Qualcomm, MTK, Intel): For SCell activation and deactivation delay requirements, it is suggested to introduce new test cases for FR2 inter-band CA scenario in Rel-16.

*Recommendations for 2nd round:*Continue discussion in the 2nd round and the agreement will be captured in the WF. |
| **Issue 8-2: TC configurations for inter-band CA requirement for FR2 UE measurement capability of independent Rx beam** | *Tentative agreements:*Moderator added some clarification in the proposal 1, i.e., “add a note to clarify that bands 1 and 2 are inter-band CA operating bands in FR2 as specified in Table 5.2A.2-1 in TS38.101-2”Agreement: * Proposal 1(Huawei, Ericsson, MTK, Nokia, Intel, Apple): For SCell activation and deactivation delay test in FR2 inter-band CA, it is suggested that the test consists of three time period. (add a note to clarify that bands 1 and 2 are inter-band CA operating bands in FR2 as specified in Table 5.2A.2-1 in TS38.101-2)
	+ Before the test starts, the UE is connected to Cell 1 (PCell) on FR2 band 1.
	+ At the beginning of T1, the UE receives an RRC message to add Cell 2 as SCell on FR2 band 2. The time duration T1 is the preparation period for the test.
	+ At the beginning of T2, the UE receives a MAC message for SCell activation. During time duration T2, the SCell activation delay and interruptions to PCell need to be tested.
	+ At the beginning of T3, the UE receives a MAC message for SCell deactivation. During time duration T3, the SCell deactivation delay and interruptions to PCell need to be tested.

FFS on proposal 2: * Proposal 2(QC): RAN4 to introduce RRM test case(s) for IBM UEs supporting inter-band FR2 CA to verify if the UE meets RRM performance requirement(s) on both inter-bands when 2 AoAs are concurrently active from different angles, provided that
	+ 2 AoAs are (pseudo) randomly selected and/or at least [X] degrees apart within a spherical coverage
		- If any restriction is identified by RF session, it should be respected and possible test directions will be updated accordingly
	+ Both inter-band CCs transmit and configure reference signal(s) for independent beam management
	+ SSB on one band and CSI-RS and/or PDCCH/PDSCH on the other band can have different numerologies
	+ At least one RRM accuracy performance requirement should be met on both bands, and FFS on which RRM requirement.

*Candidate options:**Recommendations for 2nd round:*Proposal 1 is agreeable.Continue discussion for proposal 2 in the 2nd round and the agreement will be captured in the WF. |

*Suggestion on WF/LS assignment*

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|  | **WF/LS t-doc Title**  | **Assigned Company,****WF or LS lead** |
| #1 | WF on R16 RRM enhancement part 3 - FR2 inter-band CA RRM (To Andrey: this WF is same one as in section 1.4) | Huawei |

### CRs/TPs

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

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| **CR/TP number** | **CRs/TPs Status update recommendation**  |
| R4-2015476 (Huawei CR) | *To be revised* |

## Discussion on 2nd round (if applicable)

**Issue 8-1: TC list for inter-band CA requirement for FR2 UE measurement capability of independent Rx beam**

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| **Company** | **Comments** |
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**Issue 8-2: TC configurations for inter-band CA requirement for FR2 UE measurement capability of independent Rx beam (on proposal 2)**

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| **Company** | **Comments** |
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## Summary on 2nd round (if applicable)

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

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

# Topic #9: feature list of NR RRM requirement enhancement (9-8/9-9/9-10) from thread #117

## Open issues summary

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| [9-8] | [Multiple SCell activation] | 1) Support of multiple SCell activation RRM requirement |
| [9-9] | [UE specific CBW change] | 1) Support of UE-specific CBW change RRM requirement |
| [9-10] | [Spatial relation switch for uplink] | 1) Support of UL spatial relation switch RRM requirement |

**Issue 9-1: feature 9-8, 9-9, 9-10 from thread #117**

Option 1: Specify feature group 9-8/9/10 as optional (Apple, Intel)

Option 2: Remove feature groups [9-8], [9-9], [9-10] ((MTK, Qualcomm Incorporated, CMCC, KDDI, AT&T, Ericsson, Nokia, T-Mobile USA, China Telecom, Vodafone, Verizon, Softbank, ZTE)

**Recommended WF: Majority companies support to remove feature groups 9-8, 9-9, 9-10. Companies please check whether feature groups 9-8, 9-9, 9-10 can be removed.**

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| **Company** | **Comments** |
| Apple | Option 1. As we commented in the GTW meeting for thread #117, we didn’t see any clue in R15 that those features are mandatory to UE, and we are wondering if companies could help to point out where we can find those feature descriptions in R15. We do not tend to decouple the feature and the corresponding requirement, but how to judge that (by which principle) those features are mandatory is unclear to us. |
| MTK | Option 2. These features are mandatory support in R15. Whether defining the requirement in R15 doesn’t impact these features are mandatory. |
| Ericsson | We support Option 2. The features are mandatory and so are the associated core and performance requirements. The core and performance requirements being introduced at a later stage does not change this. |
| ZTE | We support option 2. |
| Nokia | Support option 2. |
| Intel | The requirements for Multiple SCell activation,UE specific CBW change, and Spatial relation switch for uplink are introduced in Rel-16. The respective features are available starting from Rel-15 but there are no requirements.For instance, Rel-15 UE can declare that it supports the feature but does not meet the Rel-16 requirements. In case the features are not introduced in Rel-16, then the gNB may not know whether the UE can fulfil the requirements. So far, there was no clear feedback on how to handle such situations. One solution to resolve the ambiguity is to introduce separate capability (optional or mandatory with capability signalling) to make sure that gNB has sufficient information on UE implementation. Another alternative solution is to introduce the requirements in release-independent manner (i.e. define requirements in Rel-15). We would like to check companies assumption on how the gNB will understand that UE can meet the new Rel-16 requirements. |

The multiple SCell activation RRM requirement, UE-specific CBW change RRM requirement, and UL spatial relation switch RRM requirement will apply to R16 UEs, not R15 UEs.

Further discussion on the need of feature groups 9-8/9/10 will be carried out in RRM session. Note the removal of these feature groups means they are mandatory.

## 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**  |
| **Issue 9-1: feature 9-8, 9-9, 9-10 from thread #117** | *Tentative agreements:*No tentative agreement in 1st round. Based on the 1st round discussion, 2 companies supported option 1, and 13 companies supported option 2. *Candidate options:*Option 1: Specify feature group 9-8/9/10 as optional (Apple, Intel)Option 2: Remove feature groups [9-8], [9-9], [9-10] ((MTK, Qualcomm Incorporated, CMCC, KDDI, AT&T, Ericsson, Nokia, T-Mobile USA, China Telecom, Vodafone, Verizon, Softbank, ZTE)*Recommendations for 2nd round:*Continue discussion in the 2nd round and the agreement will be captured in the WF. |

*Suggestion on WF/LS assignment*

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|  | **WF/LS t-doc Title**  | **Assigned Company,****WF or LS lead** |
| #1 | WF on R16 RRM enhancement part 3 – Multiple SCell activation, UE specific CBW change and feature list 9-8/9-9/9-10)(To Andrey: this WF is same one as in section 2.4) | Apple |

### 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**  |
| XXX | *Based on 1st round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

## Discussion on 2nd round (if applicable)

**Issue 9-1: feature 9-8, 9-9, 9-10 from thread #117**

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| **Company** | **Comments** |
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## Summary on 2nd round (if applicable)

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

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