**3GPP TSG-RAN WG4 Meeting # 99-e R4-21xxxxx**

**Electronic Meeting, May. 19-27, 2021**

**Agenda item:** 9.21.1

**Source:** Moderator (Huawei, HiSilicon)

**Title:** Email discussion summary for [99-e][238] LTE\_NR\_DC\_enh2\_RRM

**Document for:** Information

# Introduction

This email thread discusses the WI on Further Multi-RAT Dual-Connectivity enhancements was approved in [RP-201040]. The objectives of the WI are duplicated as below,

|  |
| --- |
| 1. Support efficient activation/de-activation mechanism for one SCG and SCells  * Support for one SCG applies to (NG)EN-DC, and NR-DC [RAN2, RAN3, RAN4] * Support for SCells applies to NR CA, based on RAN1 leading mechanisms [RAN1, RAN2, RAN4] * This objective applies to FR1 and FR2  1. Support of conditional PSCell change/addition [RAN2,RAN3, RAN4]  * support scenarios which are not addressed in Rel-16 NR mobility WI |

Four sub-topics are discussed:

-Sub-topic 1: Work plan

-Sub-topic 2: Temporary RS for efficient SCell activation. It is mainly about the LS which has been discussed in two meeting cycles. The remaining issues are discussed herein. An incoming new LS in last meeting is discussed as well.

-Sub-topic 3: Efficient activation/de-activation mechanism for one SCG

-Sub-topic 4: Conditional PSCell change and addition

List of candidate target of email discussion for 1st round and 2nd round:

* 1st round: Invite companies to comment in each sub-topic.
* 2nd round: TBA

# Topic #1: Work Plan

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2110380 | Huawei, HiSilicon | The work plan is proposed. |

## Open issues summary

### Sub-topic 1: Work Plan

According to the WID [RP-201040], the core part of RRM shall be finalized by March 2022 (RAN #95), the performance part of RRM shall be finalized by September 2022 (RAN #97).

**RAN4#99-e**

* Discuss and approve the work plan for RRM part.
* Discuss and identify which RRM requirements need to be specified for
  + Conditional PSCell change and addition
  + Efficient activation/de-activation mechanism for one SCG
  + Efficient activation/de-activation mechanism for SCells in NR CA
* Reply RAN1/2 LS, if any

**RAN4#100-e**

* Discuss the identified RRM requirements on
  + Conditional PSCell change and addition
  + Efficient activation/de-activation mechanism for one SCG
  + Efficient activation/de-activation mechanism for SCells in NR CA
* Reply RAN1/2 LS, if any

**RAN4#100-e-Bis**

* Continue to discuss the identified RRM requirements on
  + Conditional PSCell change and addition
  + Efficient activation/de-activation mechanism for one SCG
  + Efficient activation/de-activation mechanism for SCells in NR CA
* Provide draft CR on TS38.133
* Reply RAN1/2 LS, if any

**RAN4#101-e**

* Further discuss the RRM requirements on
  + Conditional PSCell change and addition
  + Efficient activation/de-activation mechanism for one SCG
  + Efficient activation/de-activation mechanism for SCells in NR CA
* Provide and refine the draft CR

**RAN4#102-e**

* Approve the CR on TS38.133

**RAN4#102-e-Bis (RRM performance part only)**

* Discuss and decide test case lists and related parameters

**RAN4#103-e (RRM performance part only)**

• Provide draft test cases for RRM

**RAN4#104-e (RRM performance part only)**

• Approve test cases for RRM

## Companies views’ collection for 1st round

### Open issues

**Sub-topic 1: Work Plan**

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Ericsson | We are fine with the proposed work plan. |
| Intel | Thanks for the WP we are fine with it. |
| OPPO | Fine with the proposed work plan |
| Apple | Fine with the proposal |
| Nokia | The work plan looks good. |

### CRs/TPs comments collection

*None CR or TP*

## Summary for 1st round

### Open issues

**Sub-topic 1: Work Plan**

*All companies support the work plan.*

*Tentative agreements:*

*The work plan for R17 further Multi-RAT Dual-Connectivity enhancements is approved.*

*Recommendations for 2nd round: Consensus is reached and no need to discuss in the 2nd round.*

### CRs/TPs

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

*Note: The tdoc decisions shall be provided in Section 3 and this table is optional in case moderators would like to provide additional information.*

|  |  |
| --- | --- |
| **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)

N/A

# Topic #2: Temporary RS for efficient SCell activation

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [R4-2108769](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2108769.zip) | ZTE Corporation | Observation 1: Option 1a is already agreed and now the feature is complete.  Observation 2: If option 2 is to be supported, then we need to specify the time window for the DCI triggering Rel-15/Rel-16 TRS. What’s more, we also need to handle the case when UE miss one of the DCI or MAC-CE.  Observation 3: Option 2 might lead to quite amount of work in RAN4 with significant specification impact without clear benefits.  Proposal 1: Do not support option 2 but simply go with option 1a which is already agreed by RAN1. |
| R4-2108973 | Qualcomm Incorporated | Minimum Gap for AGC Measurement and Application  Proposal 1: RS symbols for AGC and time/frequency acquisition are at least 2-slot apart from each other.  Time-aligned RSs on the other Active Serving Cells in the Same Band  Observation 1: Additional RSs on multiple carriers for AGC on the to-be-activated SCell can adversely affect other UEs throughput.  Cases where UE needs to go through a coarse AGC and SSB ID detection as a part of SCell activation  Proposal 2: RAN4 does not define SCell activation requirement for a new RAN1 A-TRS triggering mechanism if SSB based coarse AGC and SSB ID detection shall be carried out as a part of legacy SCell activation sequence.  Legacy Rel-15/16 DCI based Additional SCell Activation Latency Enhancement  Proposal 3: RAN4 to determine whether or not to define requirements for additional SCell activation latency reduction based on legacy Rel-15/16 UL DCI triggering A-TRS for to-be-activated SCell. If introduced, the following should be discussed and specified in detail:   * + Corresponding SCell activation sequence   + Appliable scenarios, e.g. whether to consider unknown SCell activation for the enhancement   + When and on which carrier UE can expect the DCI   + UE behavior if all or some of the DCI are not detected during the SCell activation procedure |
| [R4-2109222](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2109222.zip) | Intel Corporation | Proposal 1: No requirement is defined for temporary RS based SCell activation targeting unknown SCell without any information.  Proposal 2: No requirement is defined for inter-band CA for temporary RS based SCell activation.  Proposal 3: We propose that for all kinds of AGC or T&F tracking operations, two slots of temporary RS resources are needed to facilitate fair performance, respectively.  Proposal 4: Specify that a 2-slot longest gap is allowed between AGC and T/F tracking for the UE.  Proposal 5: The network is not required to transmit on any other serving cell than the target SCell. |
| [R4-2109318](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2109318.zip) | Apple | Proposal 1: Minimum gap between the RS symbol(s) for AGC and the RS symbols for time/frequency acquisition is needed to account for UE AGC application time delay is 2ms.  Proposal 2: RAN4 confirms that unknown case is not a target scenario for temporary RS based SCell activation latency optimization.  Observation 1: there is no big difference between 2 slots and 2 ms for the gap. Even with 2ms gap, using temporary RS can still significantly reduce the SCell activation delay, e.g. to less than 10ms, which should be acceptable according to experience in existing LTE network even under high speed scenario.  Proposal 3: in RAN4 requirements it is assumed that UE requires to receive another RS transmitted also on the other activated serving cell in the same band in the same slot. |
| R4-2109612 | vivo | Proposal 1: For the scenario where SCell being activated is known and belongs to FR1 and if SCell measurement cycle is larger than 160ms, the minimum gap between the RS symbol(s) for AGC and the RS symbols for time/frequency acquisition is needed and 2 slots are sufficient.  Proposal 2: There are benefits when using temporary RS for time-frequency tracking after SSB based AGC for the FR1 unkown Scell activation of intra-band non-contiguous CA scenario, however the benefit is limited and we prefer option 1 for this scenario.  Proposal 3: There are benefits when using temporary RS for time-frequency tracking after SSB based AGC for the FR1 unkown Scell activation of inter band CA scenario, however the benefit is limited and we prefer option 1 for this scenario. |
| R4-2109887 | MediaTek Inc. | Proposal 1: RAN4 to inform RAN1 the minimum gap between the RS symbol(s) for AGC and the RS symbols for time/frequency acquisition is 2slots  Proposal 2: RAN4 to modify the wording as “it is not a target scenario for TRS based SCell activation latency optimization.” |
| R4-2110068 | OPPO | Proposal 1: Prefer minimum gap length as 2ms.  Proposal 2: For other scenarios of unknown SCell in FR1 (e.g., Intra-band non-continuous CA and Inter-band CA), temporary RS can be used for time frequency tracking only.  Observation 1: The benefit through temporary RS used for time/frequency tracking only in certain unknown cases could be low.  Proposal 3: For other scenarios of FR2 unknown SCell, temporary RS can be used for time frequency tracking only.  Observation 2: A Rel-15/16 SCell activation MAC-CE to trigger SCell activation and a Rel-15/16 DCI to trigger corresponding Rel-15/16 A-TRS(s), have already been supported from RAN4’s perspective. |
| R4-2110380 | Huawei, HiSilicon | Proposal 10: When SCell to be activated is known and belongs to FR1, if SCell measurement cycle is larger than 160ms, either option 1 or option 2 of the gap between the RS symbols for AGC and the RS symbols for time/frequency acquisition is acceptable.  Proposal 11: When SCell to be activated is known and belongs to FR1, if SCell measurement cycle is larger than 160ms, AGC adjustment is performed based on temporary RS on the to-be-activated SCell and another RS and/or SSB (burst) on the other activated serving cell in the same band,   * Whether these RSs are required to be transmitted in the same slot depends on UE capability. * Inform RAN2 the new UE capability.   Proposal 12: When SCell to be activated is unknown and belongs to FR1   * Intra-band non-continuous CA and inter-band CA   - UE performs AGC adjustment, cell detection based on SSB  -UE performs time-frequency tracking based on temporary RS.  -One temporary RS burst is required.  Proposal 13: If the SCell being activated is unknown and belongs to FR2 and if there is no active serving cell on that FR2 band,   * + Temporary RS can not be used for AGC   + It is not suggested that temporary RS is used for time-frequency tracking. |
| R4-2110381 | Huawei, HiSilicon | Draft LS reply on RS for efficient SCell activation in NR CA |
| R4-2110973 | Ericsson | **Proposal 2:** A gap of two slots shall be provided between TRS bursts.  **Proposal 3:** For activation of unknown SCell in FR1 with non-contiguous intra-band serving cell(s), TRS can be considered for reducing latency for time/frequency refinement, i.e., an activity following upon coarse gain setting and cell detection.  **Proposal 4:** For activation of unknown SCell in FR1 with inter-band serving cell(s), TRS can be considered for reducing latency for time/frequency refinement, i.e., an activity following upon coarse gain setting and cell detection.  **Proposal 5:** RAN4 to respond RAN1 that the RS used for gain setting do not have to be transmitted in the same slot on different carriers. |
| R4-2111283 | Nokia, Nokia Shanghai Bell | RAN4 need to define new UE requirements for fast PSCell and/or SCell activation when provided with temporary RS. |

## Open issues summary

### Sub-topic 2-1: SCell being activated is known and belongs to FR1

*Background: The followings were agreed in [*R4-2104067*]:*

|  |
| --- |
| * *SCell to be activated is known and belongs to FR1*   + *If SCell measurement cycle is equal to or smaller than 160ms*     - *temporary RS can be used for time/frequency tracking*       * *1 burst (2-slot with four CSI-RS resources) is required.*   + *If SCell measurement cycle is larger than 160ms*     - *temporary RS can be used for AGC*       * *1 burst (2-slot with four CSI-RS resources) is required*     - *temporary RS can be used for time/frequency tracking*     - *1 separate burst (2-slot with four CSI-RS resources) is required in addition to the one burst required for AGC* |

*In RAN4#98bis-e, it is confirmed that when SCell measurement cycle is larger than 160ms, minimum gap between the RS symbol(s) for AGC and the RS symbols for time/frequency acquisition is needed to account for UE AGC application time delay [R4-2105799]. The minimum gap length is not determined yet.*

**Issue 2-1-1: If SCell measurement cycle is larger than 160ms, the** **minimum gap length between the RS symbol(s) for AGC and the RS symbols for time/frequency acquisition is**

* Proposals
  + Option 1 (Qualcomm, Intel, vivo, MediaTek, Huawei, Ericsson): 2 slots
  + Option 2 (Apple, OPPO, Huawei): 2ms
* Recommended WF
  + Further discussion

**Issue 2-1-2: If SCell measurement cycle is larger than 160ms, whether the UE requires to receive another RS transmitted also on the other activated serving cell in the same band in the same slot?**

* Proposals
  + Option 1(Qualcomm, Intel, Huawei):

-These RSs are **not** required to be transmitted in the same slot

* + Option 2 (Apple):

- These RSs are required to be transmitted in the same slot

* + Option 3 (Apple, Huawei):

-UE reports capability which indicates whether UE requires to receive another RS transmitted also on the other activated serving cell in the same band in the same slot.

* Recommended WF
  + Further discussion

#### Companies views’ collection for 1st round

**Sub-topic 2-1: SCell being activated is known and belongs to FR1**

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| **Company** | **Comments** |
| Qualcomm | **Issue 2-1-1: If SCell measurement cycle is larger than 160ms, the** **minimum gap length between the RS symbol(s) for AGC and the RS symbols for time/frequency acquisition is**  Support Option 1.  With a higher SCS than 15kHz, “2ms gap” will make it harder for network to predict a resource availability on slots for T/F tracking A-TRS transmission.  **Issue 2-1-2: If SCell measurement cycle is larger than 160ms, whether the UE requires to receive another RS transmitted also on the other activated serving cell in the same band in the same slot?**  Support Option1.  With Option 2 and 3, T-put for other UEs on the other carriers in the same band can potentially get affected by the additional UE specific RSs transmitted on the other carriers in the same band. |
| Ericsson | **Issue 2-1-1: If SCell measurement cycle is larger than 160ms, the** **minimum gap length between the RS symbol(s) for AGC and the RS symbols for time/frequency acquisition is**  We support Option 1.  **Issue 2-1-2: If SCell measurement cycle is larger than 160ms, whether the UE requires to receive another RS transmitted also on the other activated serving cell in the same band in the same slot?**  We prefer Option 1.  Regarding Option 3, we do not want to introduce such capability reporting. Then better that UE does not state support of the feature as such, or that RAN4 agrees on Option 2. |
| vivo | **Issue 2-1-1: If SCell measurement cycle is larger than 160ms, the** **minimum gap length between the RS symbol(s) for AGC and the RS symbols for time/frequency acquisition is**  Support Option 1.  To our understanding the process for applying the AGC could be very quick and 2 slots are sufficient enough.  **Issue 2-1-2: If SCell measurement cycle is larger than 160ms, whether the UE requires to receive another RS transmitted also on the other activated serving cell in the same band in the same slot?**  Support Option1. |
| Intel | **Issue 2-1-1: If SCell measurement cycle is larger than 160ms, the** **minimum gap length between the RS symbol(s) for AGC and the RS symbols for time/frequency acquisition is**  We support Option 1. Any justification for 2ms?  **Issue 2-1-2: If SCell measurement cycle is larger than 160ms, whether the UE requires to receive another RS transmitted also on the other activated serving cell in the same band in the same slot?**  We prefer Option 1. |
| Huawei | **Issue 2-1-1: If SCell measurement cycle is larger than 160ms, the** **minimum gap length between the RS symbol(s) for AGC and the RS symbols for time/frequency acquisition is**  Both Option 1 and option 2 are fine. As for 15kHz SCS, 2 slots equals to 2ms. If one concrete value is preferred to define the requirements as we did for SSB processing delay for TCI state switching, we think option 2 is also a good way. To some extent, this kind of requirement is simpler.  **Issue 2-1-2: If SCell measurement cycle is larger than 160ms, whether the UE requires to receive another RS transmitted also on the other activated serving cell in the same band in the same slot?**  UE has the information of the RS signal on **activated** serving cell. On the occasion when UE performs AGC, UE can consider temporary RS on to-be-activated SCell and RS on the activated serving cells which is not required to be transmitted in the same slot.  However in last meeting some company think it depends on UE capability and implementation and there is maybe RS on the other serving cells at the same time. The temporary RS on the target cell being activated can be aligned with not only SMTC, but also TRS on the other cells. To some extent, we also think it is a kind of restriction as well (not limited by SMTC, but limited by other RS).  As this issue has been discussed for two meeting cycles, there are still two opposite positions. A compromise trade-off (Option 3) is to introduce UE capability to adapt different UE implementation. To proceed, we support both option 1 and option 3. |
| OPPO | **Issue 2-1-1: If SCell measurement cycle is larger than 160ms, the** **minimum gap length between the RS symbol(s) for AGC and the RS symbols for time/frequency acquisition is**  Support option 2 and can compromise to option 1. The minimum gap length depends on UE implementation such as AGC update periodicity, and frequency range. For SCS=15kHz, 2 slots could be enough. But 2ms can be more feasible for UE with other numerologies.  **Issue 2-1-2: If SCell measurement cycle is larger than 160ms, whether the UE requires to receive another RS transmitted also on the other activated serving cell in the same band in the same slot?**  We prefer Option 1. |
| Apple | **Issue 2-1-1: If SCell measurement cycle is larger than 160ms, the** **minimum gap length between the RS symbol(s) for AGC and the RS symbols for time/frequency acquisition is**  Support option 2. Technically, gap length depends on how often the AGC level is updated. Different UE implementation would result in different gap length. In some implementation the loop is maintained regularly in slot level. However, in other implementation the loop is maintained regularly in absolute time. On the hand, the fundamental idea of using temporary RS for SCell activation is to reduce latency. Compared with SMTC based SCell activation, using temporary RS can shorten the latency by dozens of milliseconds, especially when long SMTC periodicity is configured. With this enhancement the SCell activation delay would become less than 10ms, which is even shorter than LTE requirements. Note that in LTE 24ms SCell activation delay is acceptable mostly. Even for high speed scenario, RAN4 has discussed whether the SCell activation delay requirement needs to be enhanced and confirmed that such enhancement is not necessary. Having this information in mind, we believe it is unnecessary to further reduce the gap from 2ms to 2 slots. The gain would be quite limited, i.e. 1.5ms for 60kHz and even the same for 15kHz.  In short, having 2ms would allow more UE benefit from this feature without huge impact on the gain.  **Issue 2-1-2: If SCell measurement cycle is larger than 160ms, whether the UE requires to receive another RS transmitted also on the other activated serving cell in the same band in the same slot?**  We cannot agree on option 1, which violates the assumption we used in R15. Again, technically option 1 is feasible for certain UE implementation. However, in some other implementation, similar with R15 design, option 2 is required. Usually RRM requirements are derived based on the worst scenario. Given that option 2 is already been used in R15/R16, we don’t think corresponding implementation is unacceptable. Option 3 could be a fair compromise. |
| Nokia | **Issue 2-1-2: If SCell measurement cycle is larger than 160ms, whether the UE requires to receive another RS transmitted also on the other activated serving cell in the same band in the same slot?**  Option 1.  As a general comment it is preferred from network side to have the flexibility not having the limitation to transmit the RS in the same slot.  As Ericsson we prefer not to define another UE capability as it complicates the network operation. |
| MTK | **Issue 2-1-1: If SCell measurement cycle is larger than 160ms, the** **minimum gap length between the RS symbol(s) for AGC and the RS symbols for time/frequency acquisition is**  Support option 1. UE should have different implementations for different FRs.  **Issue 2-1-2: If SCell measurement cycle is larger than 160ms, whether the UE requires to receive another RS transmitted also on the other activated serving cell in the same band in the same slot?**  Support option 1. |

### Sub-topic 2-2: SCell being activated is unknown and belongs to FR1

*Background: In RAN4#98bis-e, the consensus is reached for the intra-band continuous CA case [R4-2105799].*

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| * *When Scell is contiguous to an active serving cell in the same band (Intra-band continuous CA)*   + *UE can perform AGC adjustment based on temporary RS;*      - *One temporary RS burst with only “2-slot with four CSI-RSs resources (4 samples)” is required when the power difference in serving cell and to be activated Scell is smaller than or equal to 6dB.*   + *No cell detection provided the conditions specified for intra-band contiguous CA case in TS38.133 section 8.3.2 are satisfied;*   + *UE can perform time-frequency tracking based on temporary RS*     - *One temporary RS burst with only “2-slot with four CSI-RSs resources (4 samples)” is required.*   + *The agreements above apply based on RAN1 working assumptions on temporary RS design provided in the LS R1-2009798.* |

**Issue 2-2-1:**

**When Scell is non-contiguous to an active serving cell in the same band (Intra-band non-continuous CA), and/or**

**When Scell to be activated and active serving cell are in the different band (Inter-band CA) , whether temporary RS can be used for time frequency tracking?**

* Proposals
  + Option1 (Qualcomm, Intel, Apple, vivo,): it is not a target scenario for temporary RS based Scell activation latency optimization.
  + Option 2(MTK): In RAN1 discussion, TRS is selected as temporary RS to expedite the activation procedure of AGC setting and time/frequency tracking because the target to be considered is the known cell. If more functionalities are confirmed to be supported by temporary RS, other RS candidates are not precluded.
  + Option 3(OPPO, Huawei, Ericsson): temporary RS can be used for time frequency tracking (For AGC: UE performs AGC adjustment based on SSB rather than temporary RS).
* Recommended WF
  + Further discussion

**Issue 2-2-2: If option 2 is agreed in issue 2-2-1, how many temporary RS bursts are required for time frequency tracking respectively?**

*Side condition (specified in existing specification): If the Scell is unknown and belongs to FR1, provided that the side condition Ês/Iot ≥ -2dB is fulfilled.*

* Proposals
  + Option 1(Huawei): One temporary RS burst with“2-slot with four CSI-RSs resources (4 samples)” is required.
* Recommended WF
  + Further discussion

#### Companies views’ collection for 1st round

**Sub-topic 2-2: Scell being activated is unknown and belongs to FR1**

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| **Company** | **Comments** |
| Qualcomm | **Issue 2-2-1: When Scell is non-contiguous to an active serving cell in the same band (Intra-band non-continuous CA) and/or when Scell to be activated and active serving cell are in the different band (Inter-band CA) , whether temporary RS can be used for time frequency tracking?**  Support Option 1.  The dominant factor in total activation latency is still SSB based AGC and SSB search processing. And with option 1a based approach, i.e. “MAC CE(s) contained in a single PDSCH to trigger both Scell activation and corresponding temporary RS(s)”, temp-RS based activation latency optimization will make it harder for network to predict a resource availability on slots for T/F tracking A-TRS which should be transmitted X times 20msec after the MAC-CE.  **Issue 2-2-2: If option 2 is agreed in issue 2-2-1, how many temporary RS bursts are required for time frequency tracking respectively?** |
| Ericsson | **Issue 2-2-1: When Scell is non-contiguous to an active serving cell in the same band (Intra-band non-continuous CA) and/or when Scell to be activated and active serving cell are in the different band (Inter-band CA) , whether temporary RS can be used for time frequency tracking?**  We support Option 3 but tend to agree also with Option 1. For long SMTC periods or SSB repetition periods there would be a latency reduction gain by providing additional TRS that UE can use for T/F tuning, but we can further discuss whether it is something for now or something for the future to define such requirements.  **Issue 2-2-2: If option 2 is agreed in issue 2-2-1, how many temporary RS bursts are required for time frequency tracking respectively?**  We think Option 1 should be enough. |
| Vivo | **Issue 2-2-1: When Scell is non-contiguous to an active serving cell in the same band (Intra-band non-continuous CA) and/or when Scell to be activated and active serving cell are in the different band (Inter-band CA) , whether temporary RS can be used for time frequency tracking?**  Support Option 1: For this scenario we think the possible gain from temporary RS is limited since the gain is only possible to be obtained from the T/F tracking. Hence this scenario should not be targeted.  **Issue 2-2-2: If option 2 is agreed in issue 2-2-1, how many temporary RS bursts are required for time frequency tracking respectively?**  Depending on the outcome of 2-2-1 |
| Intel | **Issue 2-2-1: When Scell is non-contiguous to an active serving cell in the same band (Intra-band non-continuous CA) and/or when Scell to be activated and active serving cell are in the different band (Inter-band CA) , whether temporary RS can be used for time frequency tracking?**  Support Option 1: Difficulty in UE to coordinate AGC on SSB meanwhile tracking based on temporary RS since there is no guaranteed relation between the two sets of different RS-s. Not a target scenario since the network is not required to guarantee the perfect RS-s configuration to facilitate the ‘fast’ activation.  **Issue 2-2-2: If option 2 is agreed in issue 2-2-1, how many temporary RS bursts are required for time frequency tracking respectively?**  I believe this is for option 3 not 2. This is subject to outcome of the previous issue. |
| Huawei | **Issue 2-2-1: When Scell is non-contiguous to an active serving cell in the same band (Intra-band non-continuous CA) and/or when Scell to be activated and active serving cell are in the different band (Inter-band CA) , whether temporary RS can be used for time frequency tracking?**  In theory the configuration of option 1a (MAC CE(s) contained in a single PDSCH to trigger both Scell activation and corresponding temporary RS(s)) can still work. The time for SSB detection and AGC adjustment need total 3 SMTC periodicity. It is fixed. Or network can transmit temporary RS in advance to adapt some high-end UE.  In legacy, SSB detection, AGC adjustment and t/f tracking need total 4 SMTC, if temporary RS can be configured in time, about 20% time reduction can be obtained.  **Issue 2-2-2: If option 2 is agreed in issue 2-2-1, how many temporary RS bursts are required for time frequency tracking respectively?**  Option **1.** |
| OPPO | **Issue 2-2-1:** We support Option 3 but tend to agree also with Option 1 |
| Apple | **Issue 2-2-1:**  **When Scell is non-contiguous to an active serving cell in the same band (Intra-band non-continuous CA), and/or**  **When Scell to be activated and active serving cell are in the different band (Inter-band CA) , whether temporary RS can be used for time frequency tracking?**  For unknown case network may have to blinding configure and transmit the temporary RS many times since some UE finish cell searching in 1 shot while some other UE may need up to 3 SMTC if the condition is poor. On the other hand, since cell search is needed, it will take dozens (even hundreds) of milliseconds before T/F tracking. The gain would be quite limited. |
| MTK | **Issue 2-2-1: When Scell is non-contiguous to an active serving cell in the same band (Intra-band non-continuous CA) and/or when Scell to be activated and active serving cell are in the different band (Inter-band CA) , whether temporary RS can be used for time frequency tracking?**  We support option 2. We agree that it is not a target scenario for TRS based temporary RS to improve. But if RAN 1 in the future agree on other types of temporary RS and that kind of temporary RS might further improve the cell search time, then the conclusion will be different. So we prefer to use precise wording and reply “it is not a target scenario for TRS based SCell activation latency optimization” to RAN1.  **Issue 2-2-2: If option 2 is agreed in issue 2-2-1, how many temporary RS bursts are required for time frequency tracking respectively?**  We are also fine with option 1. |

### Sub-topic 2-3: SCell to be activated belongs to FR2

*Background: The followings were captured in approved WF [*R4-2105798*]:*

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| --- |
| * *Scell being activated belongs to FR2*   + *If the Scell being activated is unknown and there is no active serving cell on that FR2 band,*      - *Temporary RS can not be used for AGC*     - *No conclusion on whether to consider the case for temporary RS based time/frequency tracking to enhance Scell activation latency.* |

**Issue 2-3-1: If there is no active serving cell on that FR2 band and the Scell being activated is unknown to UE, whether temporary RS can be used for time-frequency tracking?**

* Proposals
  + Option 1(Qualcomm, Intel, OPPO, Huawei): it is not a target scenario for temporary RS based Scell activation latency optimization.
* Recommended WF
  + Could Option 1 agreeable?

#### Companies views’ collection for 1st round

**Sub-topic 2-3: Scell to be activated belongs to FR2**

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Qualcomm | Support Option 1. |
| Ericsson | We support Option 1. |
| Vivo | Ok with option 1. |
| Intel | Option 1. |
| Huawei | Support option 1. |
| OPPO | Support Option 1. |
| Apple | Support option 1. |
| MTK | Similar comment.  We agree that it is not a target scenario for TRS based temporary RS to improve. But if RAN 1 in the future agree on other types of temporary RS and that kind of temporary RS might further improve the cell search time, then the conclusion will be different. So we prefer to use precise wording and reply “it is not a target scenario for TRS based SCell activation latency optimization” to RAN1. |

### Sub-topic 2-4: Certain TDD configurations

**Issue 2-4-1: Temporary RS bursts for certain TDD configurations**

*This issue is proposed in [R4-2109222]. Under some TDD configurations, there is not enough consecutive DL slots to accommodate* ***2-slot*** *CSI-RS in one burst.*

* Proposals
  + Option 1(Intel): For all kinds of AGC or T&F tracking operations, two slots of temporary RS resources are needed to facilitate fair performance (***Moderator added for further clarification:*** *even for some TDD configurations where no two consecutive slots are indicated as downlink slots.*)
* Recommended WF
  + Needs further discussion

#### Companies views’ collection for 1st round

**Sub-topic 2-4: Temporary RS bursts for certain TDD configurations**

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Qualcomm | Same understanding as Option 1. |
| Ericsson | Question for clarification: The proposal is about providing the same number of TRS symbols to the UE regardless of TDD configuration? |
| vivo | OK with option 1. Just to confirm for the scenario we assume that the temporary RS will not be transmitted under these TDD configurations. Anyway this could be a corner case since network may easily find other suitable places to schedule that two-slots temporary RS. |
| Intel | To Ericsson: We confirm that this proposal is about providing the same number of symbols of TRS.  To vivo: But we don’t think the network avoids transmitting temporary RS in such case. Please see RAN1 spec 38.214:  For a NZP-CSI-RS-ResourceSet configured with the higher layer parameter trs-Info, the UE shall assume the antenna port with the same port index of the configured NZP CSI-RS resources in the NZP-CSI-RS-ResourceSet is the same.  - For frequency range 1, the UE may be configured with one or more NZP CSI-RS set(s), where a NZP-CSI-RS-ResourceSet consists of four periodic NZP CSI-RS resources in two consecutive slots with two periodic NZP CSI-RS resources in each slot. If no two consecutive slots are indicated as downlink slots by tdd-UL-DL-ConfigurationCommon or tdd-UL-DL-ConfigDedicated, then the UE may be configured with one or more NZP CSI-RS set(s), where a NZP-CSI-RS-ResourceSet consists of two periodic NZP CSI-RS resources in one slot. |
| Huawei | We understand the logic of option 1. But it is not clear, what’s the next step if option 1 is agreeable? Increasing the burst number for TDD configuration or something else? |
| OPPO | Option 1 is fine. The motivation of this issue needs to be clarified more. Some restriction for burst, or more bursts ? |
| Apple | OK with option 1. |
| MTK | OK with option 1. |

### Sub-topic 2-5: New incoming LS [R4-2107609]

***Background:*** *The following reply LS was sent from RAN1 to RAN4 [R4-2107609], the content is duplicated as below:*

|  |
| --- |
| ***1. Overall Description:***  *With respect to efficient SCell activation for NR CA, RAN1 would like to inform RAN4 the following RAN1 agreement,*  ***Agreement***  *For efficient activation of SCells*   * *Option 1a: MAC CE(s) contained in a single PDSCH to trigger both SCell activation and corresponding temporary RS(s)*   + *Details FFS including timeline design for receiving temporary RS*   *Note: Separate from the support of Option 1a, it is up to RAN4 whether or not to consider an activation time enhancement for Option 2 without requiring further RAN1 work*   * *Option 2: A Rel-15/16 SCell activation MAC-CE to trigger SCell activation and a Rel-15/16 DCI to trigger corresponding Rel-15/16 A-TRS(s)* |

**Issue 2-5-1: Whether or not RAN4 specify requirements for Option 2**

* Proposals
  + Option 1(ZTE): Do not support option 2 but simply go with option 1a.
  + Option 2 (Qualcomm): RAN4 to determine whether or not to define requirements for additional SCell activation latency reduction based on legacy Rel-15/16 UL DCI triggering A-TRS for to-be-activated SCell. If introduced, the following should be discussed and specified in detail:
    - Corresponding SCell activation sequence
    - Appliable scenarios, e.g. whether to consider unknown SCell activation for the enhancement
    - When and on which carrier UE can expect the DCI
    - UE behavior if all or some of the DCI are not detected during the SCell activation procedure
  + Option 3 (OPPO): A Rel-15/16 SCell activation MAC-CE to trigger SCell activation and a Rel-15/16 DCI to trigger corresponding Rel-15/16 A-TRS(s), have already been supported from RAN4’s perspective.
* Recommended WF
  + Further discussion

#### Companies views’ collection for 1st round

**Sub-topic 2-5: New incoming LS**

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Qualcomm | We are positive about Option 2 based SCell activation latency enhancement “*A Rel-15/16 SCell activation MAC-CE to trigger SCell activation and a Rel-15/16 DCI to trigger corresponding Rel-15/16 A-TRS(s)*” unless we see a critical issue with it because it is more or less legacy-compatible in terms of signalling, i.e. both network and UE can enhance the SCell activation latency without much change to signalling.  We suggest that companies bring more investigation in terms of applicable scenarios, constraints if any, etc and discuss it in the next RAN4 meeting. |
| Ericsson | Prefer Option 1.  If anything else is agreed, then we agree with Qualcomm on what needs to be discussed (as captured in Option 2).  For Option 3 we do not quite understand how this would have been accounted for already by RAN4. We have not accounted for this in existing SCell activation timelines, hence there is work to be done. |
| vivo | Open for discussion regarding option 2. If no consensus then we can go back to option 1. |
| Intel | Nothing to be done in RAN4. Is the proponent intention to have tightened delay requirements separately for the cases in option 2? |
| Huawei | Support option 1.  Option 1a is formally agreed in RAN1, and it means that network shall support configuration for 1a. If RAN4 also specify requirements for option 2, then network shall have two sets of configuration and UE shall have two sets of behaviour. It will increase the complexity for both UE and network.  In addition, the gain of option 2 is not clear so far. Before we decide to specify requirements for an option which is not agreed in other RAN group, and there is already an option can work well (option 1a), we shall be careful. At least the feasibility and sufficient gain of the additional option shall be justified firstly.  Technically, in option 2, a separate DCI for A-TRS may receive before or after SSB occasion. For different case, there is different UE behaviour. Then multiple branch shall be considered, and the requirements are accordingly complicated. |
| ZTE | Support Option 1. The second option from RAN1 LS is not necessary, the feature is already complete with RAN1 option 1a. |
| OPPO | RAN4 understands the improvement in option 1a in LS that MAC CE(s) contained in a single PDSCH to trigger both SCell activation and corresponding temporary RS(s).  To be clarified, for option 3, the current RAN4 requirements can be enough to support the option 2 in LS. The legacy SCell activation MAC-CE and Rel-15/16 A-TRS can be fulfilled or supported by RAN4 current requirement, especially in test cases. Agree with intel nothing to be done in RAN4. |
| Apple | Technically both option 1a and 2 in RAN1 LS can work. However, we prefer to go with option 1a in RAN1 LS to simplify RAN4 requirements. So far we don’t see significant gain of option 2. We are open to further discussion if proponent of option 2 can provide more justification |
| Nokia | Prefer option 1.  RAN4 workload is already quite high. |
| MTK | Prefer option 1. |

## Summary for 1st round

### Open issues

#### Sub-topic 2-1: SCell being activated is known and belongs to FR1

**Issue 2-1-1: If SCell measurement cycle is larger than 160ms, the** **minimum gap length between the RS symbol(s) for AGC and the RS symbols for time/frequency acquisition is**

* + Option 1: 2 slots
  + Option 2: 2ms

*Five companies support option 1. Two companies support both option 1 and option 2. One company supports option 2. The views are diverse.*

*No tentative agreements.*

*Candidate options:*

*Option 1: 2 slots*

*Option 2: 2ms*

*Recommendations for 2nd round: Further discussion*

**Issue 2-1-2: If SCell measurement cycle is larger than 160ms, whether the UE requires to receive another RS transmitted also on the other activated serving cell in the same band in the same slot?**

*Seven companies support option 1. One company think both option 1 and option 3 are fine. One company supports option2 and think option 3 is a fire compromise. The views are diverse.*

*No tentative agreements.*

*Candidate options:*

*Option 1: These RSs are not required to be transmitted in the same slot*

*Option 2: These RSs are required to be transmitted in the same slot*

*Option 3: UE reports capability which indicates whether UE requires to receive another RS transmitted also on the other activated serving cell in the same band in the same slot.*

*Recommendations for 2nd round: Further discussion*

#### Sub-topic 2-2: SCell being activated is unknown and belongs to FR1

**Issue 2-2-1:**

**When Scell is non-contiguous to an active serving cell in the same band (Intra-band non-continuous CA), and/or**

**When Scell to be activated and active serving cell are in the different band (Inter-band CA) , whether temporary RS can be used for time frequency tracking?**

*Most companies support option 1. One company has concern on the wording of option 1. They think it is not a target scenario for TRS based temporary RS. To be more accurate, we suggest to rewording option 1. Please check if the below wording is acceptable.*

*No tentative agreements.*

*Candidate options:*

*Option1: it is not a target scenario for temporary RS (reusing TRS structure) based Scell activation latency optimization.*

*Option 3: TRS based temporary RS can be used for time frequency tracking (For AGC: UE performs AGC adjustment based on SSB rather than temporary RS).*

*Recommendations for 2nd round: Further discussion*

**Issue 2-2-2: If option 2 is agreed in issue 2-2-1, how many temporary RS bursts are required for time frequency tracking respectively?**

*This issue depends on the outcome of issue 2-2-1.*

*No tentative agreements.*

*Candidate options:*

*Option 1: One temporary RS burst with“2-slot with four CSI-RSs resources (4 samples)” is required.*

*Recommendations for 2nd round: Further discussion*

#### Sub-topic 2-3: SCell to be activated belongs to FR2

**Issue 2-3-1: If there is no active serving cell on that FR2 band and the Scell being activated is unknown to UE, whether temporary RS can be used for time-frequency tracking?**

*Technically all companies have the same understanding and support option 1. One company think the interpretation of “temporary RS” is supposed to be made (it shall be TRS based), so we added one sentence for clarification: The agreement above applies based on RAN1 working assumptions on temporary RS design provided in the LS R1-2009798.*

*Tentative agreements:*

*When SCell to be activated belongs to FR2, if there is no active serving cell on that FR2 band and the Scell being activated is unknown to UE,*

* *It is not a target scenario for temporary RS based Scell activation latency optimization.*
* *The agreement above applies based on RAN1 working assumptions on temporary RS design provided in the LS R1-2009798.*

*Recommendations for 2nd round: No further discussion*

#### Sub-topic 2-4: Certain TDD configurations

**Issue 2-4-1: Temporary RS bursts for certain TDD configurations**

*Technically all companies have the same understanding on temporary RS configuration in certain TDD scenario. After further checking with proponent, no RRM specification impact is expected so far.*

*Tentative agreements:*

For all kinds of AGC or T&F tracking operations, two slots of temporary RS resources are needed to facilitate fair performance (***Moderator added for further clarification:*** *even for some TDD configurations where no two consecutive slots are indicated as downlink slots.*)

*Recommendations for 2nd round: No further discussion*

#### Sub-topic 2-5: New incoming LS [R4-2107609]

*8 companies support option 1. Two companies are* *open to further discussion if proponent of option 2 can provide more justification. One company is positive about option 2*

*No tentative agreements.*

*Candidate options:*

*Option 1(Ericsson, vivo, Intel, Huawei, ZTE, OPPO, Nokia, MTK): Do not support option 2 but simply go with option 1a.*

*Option 1a (vivo, Apple): open to further discussion if proponent of option 2 can provide more justification.*

*Option 2 (Qualcomm): RAN4 to determine whether or not to define requirements for additional SCell activation latency reduction based on legacy Rel-15/16 UL DCI triggering A-TRS for to-be-activated SCell. If introduced, the following should be discussed and specified in detail:*

* *Corresponding SCell activation sequence*
* *Appliable scenarios, e.g. whether to consider unknown SCell activation for the enhancement*
* *When and on which carrier UE can expect the DCI*
* *UE behavior if all or some of the DCI are not detected during the SCell activation procedure*

*Recommendations for 2nd round: Further discussion*

### CRs/TPs

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

*Note: The tdoc decisions shall be provided in Section 3 and this table is optional in case moderators would like to provide additional information.*

|  |  |
| --- | --- |
| **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)

#### Sub-topic 2-1: SCell being activated is known and belongs to FR1

**Issue 2-1-1: If SCell measurement cycle is larger than 160ms, the** **minimum gap length between the RS symbol(s) for AGC and the RS symbols for time/frequency acquisition is**

* Proposals
  + Option 1 (Qualcomm, Ericsson, vivo, Intel, Huawei, OPPO, MTK): 2 slots
  + Option 2 (Apple, Huawei, OPPO): 2ms

**Issue 2-1-2: If SCell measurement cycle is larger than 160ms, whether the UE requires to receive another RS transmitted also on the other activated serving cell in the same band in the same slot?**

* Proposals
  + Option 1(Qualcomm, Ericsson, vivo, Intel, Huawei, OPPO, Nokia, MTK):

-These RSs are **not** required to be transmitted in the same slot

* + Option 2 (Apple):

- These RSs are required to be transmitted in the same slot

* + Option 3 (Apple, Huawei):

-UE reports capability which indicates whether UE requires to receive another RS transmitted also on the other activated serving cell in the same band in the same slot.

**Companies views’ collection for 2nd round**

**Sub-topic 2-1: SCell being activated is known and belongs to FR1**

|  |  |
| --- | --- |
| **Company** | **Comments** |
|  | **Issue 2-1-1: If SCell measurement cycle is larger than 160ms, the** **minimum gap length between the RS symbol(s) for AGC and the RS symbols for time/frequency acquisition is**  **Issue 2-1-2: If SCell measurement cycle is larger than 160ms, whether the UE requires to receive another RS transmitted also on the other activated serving cell in the same band in the same slot?** |
| Apple | **Issue 2-1-1: If SCell measurement cycle is larger than 160ms, the** **minimum gap length between the RS symbol(s) for AGC and the RS symbols for time/frequency acquisition is**  Support option 2. On top of the justifications we provided in the 1st round, we would like to highlight that option 1 and 2 have same requirement for 15kHz. Gain of option 1 compared with option 2 is 1ms for 30kHz and 1.5ms for 60kHz. We don’t think this is huge improvement considering using temporary RS can reduce the SCell activation delay to less than 10ms, which is a lot faster than LTE requirements. The drawback of option 1 is that UE which requires 2ms gap could not benefit from this feature.  **Issue 2-1-2: If SCell measurement cycle is larger than 160ms, whether the UE requires to receive another RS transmitted also on the other activated serving cell in the same band in the same slot?**  Option 1 is NOT acceptable to us. In short, option 1 is feasible but not for all kinds of UE implementation. Implementation with option 2 already exists and allowed since R15. We don’t understand the logic that such assumption has to be changed for all kinds of UE implementation when T-RS is used. Option 3 can be a compromise. |
| vivo | **Issue 2-1-1: If SCell measurement cycle is larger than 160ms, the** **minimum gap length between the RS symbol(s) for AGC and the RS symbols for time/frequency acquisition is**  Support option 1. 2 slots are sufficient long for AGC update.  **Issue 2-1-2: If SCell measurement cycle is larger than 160ms, whether the UE requires to receive another RS transmitted also on the other activated serving cell in the same band in the same slot?**  Prefer for option 1. |
| Huawei | **Issue 2-1-1: If SCell measurement cycle is larger than 160ms, the** **minimum gap length between the RS symbol(s) for AGC and the RS symbols for time/frequency acquisition is**  Fine with both options. To proceed, could we agree on the worst value to accommodate worst implementation? 2ms.  **Issue 2-1-2: If SCell measurement cycle is larger than 160ms, whether the UE requires to receive another RS transmitted also on the other activated serving cell in the same band in the same slot?**  Option 3 is a compromise. |
| Ericsson | **Issue 2-1-1: If SCell measurement cycle is larger than 160ms, the** **minimum gap length between the RS symbol(s) for AGC and the RS symbols for time/frequency acquisition is**  Support Option 1.  **Issue 2-1-2: If SCell measurement cycle is larger than 160ms, whether the UE requires to receive another RS transmitted also on the other activated serving cell in the same band in the same slot?**  Prefer Option 1.  Prefer to avoid additional capabilities.  @Apple: This is a new feature. It is assumed that both specification and UE implementation need to be adapted to support it. This does not only apply to higher level functionalities, but also to those closer to the radio e.g. gain setting etc. |
| Qualcomm | **Issue 2-1-1: Option 1.**  **Issue 2-1-2: Option 1.** |
| OPPO | **Issue 2-1-1: Option 1 or 2.**  **Issue 2-1-2: Option 1.** |

#### Sub-topic 2-2: SCell being activated is unknown and belongs to FR1

**Issue 2-2-1:**

**When Scell is non-contiguous to an active serving cell in the same band (Intra-band non-continuous CA), and/or**

**When Scell to be activated and active serving cell are in the different band (Inter-band CA) , whether temporary RS can be used for time frequency tracking?**

* Proposals
  + Option1 (Qualcomm, Ericsson, vivo, Intel, OPPO, Apple, MTK): it is not a target scenario for temporary RS (reusing TRS structure) based Scell activation latency optimization.
  + Option 3(Ericsson, Huawei): temporary RS can be used for time frequency tracking (For AGC: UE performs AGC adjustment based on SSB rather than temporary RS).

**Issue 2-2-2: If option 2 is agreed in issue 2-2-1, how many temporary RS bursts are required for time frequency tracking respectively?**

*Side condition (specified in existing specification): If the Scell is unknown and belongs to FR1, provided that the side condition Ês/Iot ≥ -2dB is fulfilled.*

* Proposals
  + Option 1(Huawei): One temporary RS burst with“2-slot with four CSI-RSs resources (4 samples)” is required.

**Companies views’ collection for 2nd round**

**Sub-topic 2-2: Scell being activated is unknown and belongs to FR1**

|  |  |
| --- | --- |
| **Company** | **Comments** |
|  | **Issue 2-2-1: When Scell is non-contiguous to an active serving cell in the same band (Intra-band non-continuous CA) and/or when Scell to be activated and active serving cell are in the different band (Inter-band CA) , whether temporary RS can be used for time frequency tracking?**  **Issue 2-2-2: If option 2 is agreed in issue 2-2-1, how many temporary RS bursts are required for time frequency tracking respectively?** |
| Apple | **Issue 2-2-1: When Scell is non-contiguous to an active serving cell in the same band (Intra-band non-continuous CA) and/or when Scell to be activated and active serving cell are in the different band (Inter-band CA) , whether temporary RS can be used for time frequency tracking?**  Continue supporting option 1. Gain of option 3 is not that obvious considering the potential waste of resource and interference. |
| Vivo | Issue 2-2-1:  Support option 1. |
| Huawei | **Issue 2-2-1: When Scell is non-contiguous to an active serving cell in the same band (Intra-band non-continuous CA) and/or when Scell to be activated and active serving cell are in the different band (Inter-band CA) , whether temporary RS can be used for time frequency tracking?**  To proceed, can compromise to option 1. |
| Ericsson | **Issue 2-2-1: When Scell is non-contiguous to an active serving cell in the same band (Intra-band non-continuous CA) and/or when Scell to be activated and active serving cell are in the different band (Inter-band CA) , whether temporary RS can be used for time frequency tracking?**  We can compromise to Option 1 (see also comment from first round) |
| Qualcomm | **Issue 2-2-1: Option 1.** |
| OPPO | **Issue 2-2-1: Option 1.** |

#### Sub-topic 2-5: New incoming LS [R4-2107609]

**Issue 2-5-1: Whether or not RAN4 specify requirements for Option 2**

* Proposals
  + Option 1(Ericsson, vivo, Intel, Huawei, ZTE, OPPO, Nokia, MTK): Do not support option 2 but simply go with option 1a.
  + Option 1a (vivo, Apple): open to further discussion if proponent of option 2 can provide more justification.
  + Option 2 (Qualcomm): RAN4 to determine whether or not to define requirements for additional SCell activation latency reduction based on legacy Rel-15/16 UL DCI triggering A-TRS for to-be-activated SCell. If introduced, the following should be discussed and specified in detail:
    - Corresponding SCell activation sequence
    - Appliable scenarios, e.g. whether to consider unknown SCell activation for the enhancement
    - When and on which carrier UE can expect the DCI
    - UE behavior if all or some of the DCI are not detected during the SCell activation procedure

**Companies views’ collection for 2nd round**

|  |  |
| --- | --- |
| **Company** | **Comments** |
|  | **Issue 2-5-1: Whether or not RAN4 specify requirements for Option 2** |
| Apple | **Issue 2-5-1: Whether or not RAN4 specify requirements for Option 2**  Support option 1 and 1a. |
| vivo | Option 1 or 1a is ok |
| Huawei | Either Option 1 or 1a is ok |
| Ericsson | Option 1 or 1a. Both are OK. |
| Qualcomm | Issue 2-5-1: It is too early to preclude Option 2. We understand that there can be some convoluted cases to define requirements. Companies can further investigate if Option 2 can be considered within reasonable limits. |

# Topic #3: Efficient activation/de-activation mechanism for one SCG

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2110380 | Huawei, HiSilicon | Proposal 4: PSCell activation delay shall be specified and the detailed schemes wait for RAN2.  Proposal 5: The requirements for RLM on deactivated PSCell are supposed to be specified if RAN2 decides to do so.  Proposal 6: The requirements for BFD/BFR/beam management on deactivated PSCell are supposed to be specified if RAN2 decides to do so.  Proposal 7: The L3 measurement requirements on deactivated PSCell can be discussed in RAN4.  Proposal 8: Focus on the main functionality of SCG activation/deactivation and the requirements for other enhancements are deprioritized. |
| R4-2110973 | Ericsson | Observation 1: For the SCG activation/deactivation feature to be attractive, it needs to bring some benefits over existing features. Particularly,   * transition time from deactivated to active SCG state needs to be shorter than for existing procedures for PSCell addition, and this calls for RRM measurements in deactivated SCG state, and * power consumption for RRM measurements in deactivated SCG state need to be less than for such measurements in active SCG state, and this calls for sparser measurements in deactivated SCG state.   Proposal 1: RAN4 to study what RRM measurements are needed for UE maintaining a good enough downlink synchronization to allow a quick transition from deactivated to active SCG state. |
| R4-2111283 | Nokia, Nokia Shanghai Bell | Observation 1: To achieve a fast offloading and high peak data rate, the 2nd leg needs to be set-up, configured and activated fast.  Observation 2: There is a trade-off between 1) fast offloading in case of data activation and 2) UE power saving in case of low activity to achieve best performance.  Observation 3: Existing MCG measurement requirements apply for the MCG when the SCG is deactivated.  Observation 4: RAN4 need to define minimum measurement requirements for a deactivated PSCell  Observation 5: RAN4 should develop reporting requirements for deactivated SCG.  Observation 6: RAN4 to develop measurement accuracy requirements for deactivated SCG.  Observation 7: RAN4 need to develop activation and deactivation delay requirements for SCG.  Observation 8: RAN4 need to define requirement for SCG deactivation delay requirement when one or more Scells in SCG are active or dormant  Observation 9: RAN4 should additionally define minimum delay requirements for direct activation of SCG  Observation 10: RAN4 to discuss any interruption requirements related to activation/deactivation of SCG.  Observation 11: In order for SCG deactivation to provide additional system benefits over existing features, the SCG activation procedure would need to be faster than corresponding existing procedure of deconfiguring/configuring SCG, including UE requirements.  Observation 12: RAN4 to discuss defining reduced physical layer processing delay for SCG activation use case. |

## Open issues summary

### Sub-topic 3-1: General RRM impact

This sub-topic intends to identify the RRM impact due to Efficient activation/de-activation mechanism for one SCG.

**Issue 3-1-1: RRM measurement on PSCell after SCG deactivation**

* Proposals
  + Option 1 (Huawei, Ericsson, Nokia): L3 measurement requirements on deactivated PSCell are supposed to be discussed

- Option 1a: RAN4 to study what RRM measurements are needed for UE maintaining downlink synchronization to allow a quick transition from deactivated to active SCG state (Ericsson, Nokia)

- Option 1b: RAN4 should develop reporting requirements for deactivated PSCell (Nokia)

- Option 1c: RAN4 should develop measurement accuracy requirements for deactivated SCG (Nokia)

*Note: Option 1a, 1b, 1c don’t conflict with each other, and multiple can be selected if reasonable.*

* Recommended WF
  + Further discussion

**Issue 3-1-2: MCG measurement requirements**

* Proposals
  + Option 1 (Nokia): Existing MCG measurement requirements apply for the MCG when the SCG is deactivated.
* Recommended WF
  + Is option 1 agreeable?

**Issue 3-1-3: SCG activation/deactivation delay requirements**

* Proposals
  + Option 1 (Huawei, Nokia): Activation/ deactivation delay requirements for SCG is supposed to be specified
* Recommended WF
  + Further discussion

**Issue 3-1-4: SCG deactivation delay requirement when one or more Scells in SCG are active or dormant.**

* Proposals
  + Option 1 (Nokia): RAN4 will need to define requirement for SCG deactivation delay requirement when one or more Scells in SCG are active or dormant [R4-2111283 Obs8]
* Recommended WF
  + Further discussion

**Issue 3-1-5: Additionally define minimum delay requirements for direct activation of SCG**

* Proposals
  + Option 1 (Nokia): RAN4 should additionally define minimum delay requirements for direct activation of SCG [R4-2111283 Obs9]
* Recommended WF
  + Further discussion

**Issue 3-1-6: RLM, BFD, BFR, Beam management on PSCell after SCG deactivation**

* Proposals
  + Option 1 (Huawei): RAN4 to discuss the requirements for RLM/BFD/BFR/beam management on deactivated PSCell, if RAN2 decides to do so.
* Recommended WF
  + Further discussion

**Issue 3-1-7: Interruption requirements related to activation/deactivation of SCG**

* Proposals
  + Option 1 (Nokia): RAN4 to discuss any interruption requirements related to activation/deactivation of SCG [R4-2111283 Obs10].
* Recommended WF
  + Further discussion

**Issue 3-1-8: Reduced physical layer processing delay for SCG activation use case**

* Proposals
  + Option 1 (Nokia): RAN4 to discuss defining reduced physical layer processing delay for SCG activation use case [R4-2111283 Obs12].
* Recommended WF
  + Further discussion

#### Companies views’ collection for 1st round

**Sub-topic 3-1: General RRM impact**

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Qualcomm | **Issue 3-1-1: RRM measurement on PSCell after SCG deactivation**  Okay with “study/discuss”. It’s a bit premature to say “develop”  **Issue 3-1-2: MCG measurement requirements**  Okay with “Option 1” in principle, but we do not want to make a solid decision in this meeting.  **Issue 3-1-3: SCG activation/deactivation delay requirements**  Okay with “Option 1” in principle.  **Issue 3-1-4: SCG deactivation delay requirement when one or more Scells in SCG are active or dormant.**  We first want to check SCG deactivation signalling/procedure when there is active/dormant Scell(s) in to-be-deativated SCG.  **Issue 3-1-5: Additionally define minimum delay requirements for direct activation of SCG**  We first want to check SCG reconfiguration signalling and reconfiguration/activation procedure in detail.**Issue 3-1-6: RLM, BFD, BFR, Beam management on PSCell after SCG deactivation**  Pending on RAN2 decision. And okay with the proposal in principle.  **Issue 3-1-7: Interruption requirements related to activation/deactivation of SCG**  Okay with the proposal in principle.  **Ssue 3-1-8: Reduced physical layer processing delay for SCG activation use case**  Not sure if RAN4 RRM alone can make a decision. |
| Ericsson | **Issue 3-1-1: RRM measurement on PSCell after SCG deactivation**  We support Option 1.  **Issue 3-1-2: MCG measurement requirements**  We would like to rephrase this into “Investigate whether existing MCG measurement requirements can apply for the MCG when the SCG is deactivated.”  The reason is that there may be some impacts on serving cells in MCG e.g. from interruptions caused by deactivated SCG measurements etc.  **Issue 3-1-3: SCG activation/deactivation delay requirements**  We support Option 1.  **Issue 3-1-4: SCG deactivation delay requirement when one or more Scells in SCG are active or dormant.**  We would like to rephrase this into “Investigate whether RAN4 will need to define requirement for SCG deactivation delay requirement when one or more Scells in SCG are active or dormant.”  The reason is that today, there is no difference between activation delay of single Scell (8.3.3) and multiple Scells (8.3.8). So it is not clear that such equirements are needed. Therefore “RAN4 will need to define...” is too strong.  **Issue 3-1-5: Additionally define minimum delay requirements for direct activation of SCG**  We would like to rephrase this into “Investigate whether RAN4 should additionally define minimum delay requirements for direct activation of SCG.”  It is not clear here what direct activation would mean, to start with. In legacy, PSCell is always directly activated at addition. Is the intention here that when UE gets the RRC configuration for SCG with PSCell in activte state (i.e. legacy behaviour), there would also be one or more Scells that are added in active state? We can discuss further the different scenarios, but at this point we think “RAN4 should additionally define...” is a little strong (although *should* is weaker than e.g. *shall*).  **Issue 3-1-6: RLM, BFD, BFR, Beam management on PSCell after SCG deactivation**  We agree with Option 1. If RAN2 agrees such active beam management shall be supported for deactivated SCG, then RAN4 shall at least discuss requirements in that area.  **Issue 3-1-7: Interruption requirements related to activation/deactivation of SCG**  We agree with Option 1, and would additionally want to add also interruptions related to measurements on deactivated SCG.  **Ssue 3-1-8: Reduced physical layer processing delay for SCG activation use case**  We agree with Option 1. Deactivated SCG should be quite similar to deactivated Scell, i.e., SW is already loaded, memory is already allocated, etc. So there should be opportunities for trimming the individual timeline contributors compared e.g. to PSCell addition or PSCell change scenarios. |
| Huawei | **Issue 3-1-1: RRM measurement on PSCell after SCG deactivation**  Support Option 1. For option 1c, we don’t think measurement accuracy will be changed on deactivated PSCell. Reduction of measurement accuracy will impact the mobility performance.  **Issue 3-1-2: MCG measurement requirements**  Option 1 is reasonable.  To Ericsson, we think the measurement requirements here option 1 means the cell detection, measurement period related requirements, rather than interruption. For interruption we can consider it in issue 3-1-7.  However we agree with Ericsson, the wording can be rephrased as “Investigate whether existing MCG measurement requirements can apply for the MCG when the SCG is deactivated.” This is the first meeting, companies need time to think more.  **Issue 3-1-3: SCG activation/deactivation delay requirements**  We support Option 1.  **Issue 3-1-4: SCG deactivation delay requirement when one or more Scells in SCG are active or dormant.**  Not sure whether this requirement needs to be specified.  When the target MN indicate the SCG state as “deactivated”, the whole SGC including PSCell, active Scells and dormant Scells enters to “deactivated” state. The UE behaviour, in our understanding, is turning off RF. This is the same as Scell deactivation procedure. And for Scell deactivation requirements, there is no difference between one Scell and multiple Scells deactivations.  **Issue 3-1-5: Additionally define minimum delay requirements for direct activation of SCG**  Needs clarification on what is “direct activation of SCG’.  In our understanding, if target MN indicate the SCG state as “activated”,  - PSCell is always activated  - Scell is deactivated (for default) or “direct activated” (R16 Scell direct activation),  We think there are requirements in R15/R16 for the above behaviour. We don’t understand what kind of “additional” requirements shall be considered here.  **Issue 3-1-6: RLM, BFD, BFR, Beam management on PSCell after SCG deactivation**  Agree with Option 1, if RAN2 decides to do so.  **Issue 3-1-7: Interruption requirements related to activation/deactivation of SCG**  Option 1 is reasonable if any. Agree with Ericsson, the interruption due to measurement can be considered as well.  **Issue 3-1-8: Reduced physical layer processing delay for SCG activation use case**  Need further discussion. This is not in the WI scope. |
| Apple | **Issue 3-1-1: RRM measurement on PSCell after SCG deactivation**  Some study is needed before we confirm that reporting and/or accuracy requirement are necessary.  **Issue 3-1-2: MCG measurement requirements**  In principle it is OK. However, maybe we don’t fully get the point. In our view, PSS/SSS detection and measurement requirements on MCG shall apply (in terms of number of samples) regardless whether SCG is deactivated or not.  **Issue 3-1-3: SCG activation/deactivation delay requirements**  Support option 1.  **Issue 3-1-4: SCG deactivation delay requirement when one or more Scells in SCG are active or dormant.**  Some study is necessary before we confirm this is necessary, e.g. what is supported status of other Scells in SCG?  **Issue 3-1-5: Additionally define minimum delay requirements for direct activation of SCG**  We shall wait for the conclusion of the procedure. “**direct activation of SCG**” looks like legacy PSCell addition.  **Issue 3-1-6: RLM, BFD, BFR, Beam management on PSCell after SCG deactivation**  Not sure if such functionalities are needed or not. Input from other working groups can help.  **Issue 3-1-7: Interruption requirements related to activation/deactivation of SCG**  Option 1 makes sense to us.  **Issue 3-1-8: Reduced physical layer processing delay for SCG activation use case**  Is this in the scope? Maybe further discussion is needed. |
| Nokia | **Issue 3-1-1: RRM measurement on PSCell after SCG deactivation**  Support option 1. In general including discussing the listed options 1a,b,c.  To QC: the outcome of the study and discussion will be possible UE reporting requirements  To HW: for accuracy RAN4 would need to at least discuss and agree whether it will change or not as a starting point.  **Issue 3-1-2: MCG measurement requirements**  Support option 1.  To QC and Ericsson: the observation/proposal is ‘Existing MCG measurement requirements apply for the MCG when the SCG is deactivated’. Hence, whether the MCG measurement apply or not. Interruptions is second but we are fine to discuss further.  **Issue 3-1-3: SCG activation/deactivation delay requirements**  Support option 1.  **Issue 3-1-4: SCG deactivation delay requirement when one or more Scells in SCG are active or dormant.**  Support option 1.  We are fine using Ericsson’s re-phrased proposal and continue the discussion (as was intention).  **Issue 3-1-5: Additionally define minimum delay requirements for direct activation of SCG**  Support option 1.  Similarly, for this Issue, we are fine to further discuss.  **Issue 3-1-6: RLM, BFD, BFR, Beam management on PSCell after SCG deactivation**  Support option 1.  Similar here the RAN4 work and discussions will depend RAN2 decisions.  **Issue 3-1-7: Interruption requirements related to activation/deactivation of SCG**  Support option 1.  Agree with Ericsson’s addition that also measurement on deactivated SCG needs to be considered.  **Issue 3-1-8: Reduced physical layer processing delay for SCG activation use case**  Support option 1.  This should be within the WI scope as RAN4 is already having such delay parts in use when considering PSCell addition. As the SCG activation scenario is considering an already existing SCG there should not really be a need for e.g. for the SW processing time. |
|  |  |

## Summary for 1st round

### Open issues

#### Sub-topic 3-1: General RRM impact

*Based on the views from companies in 1st round discussion, the possible/potential RRM impacts due to* *efficient activation/de-activation mechanism for one SCG are listed as below:*

* *RAN4 to discuss the requirements of RRM measurement on PSCell after SCG deactivation (Issue 3-1-1)*
* *RAN4 to study what RRM measurements are needed for UE maintaining downlink synchronization to allow a quick transition from deactivated to active SCG state*
* *RAN4 to discuss the requirements of SCG activation/deactivation delay requirements (Issue 3-1-3)*
* *RAN4 to discuss the requirements for RLM/BFD/BFR/beam management on deactivated PSCell, if RAN2 decides to do so (Issue 3-1-6)*
* *RAN4 to discuss any interruption requirements related to activation/deactivation of SCG (Issue 3-1-7)*

*For the other issues (Issue 3-1-1, Issue 3-1-2 ), further discussion are needed in the second round.*

**Issue 3-1-1: RRM measurement on PSCell after SCG deactivation**

* Proposals
  + Option 1: L3 measurement requirements on deactivated PSCell are supposed to be discussed

- Option 1b: RAN4 should develop reporting requirements for deactivated PSCell (Nokia)

- Option 1c: RAN4 should develop measurement accuracy requirements for deactivated SCG (Nokia)

**Issue 3-1-2: MCG measurement requirements**

* Proposals
  + Option 1: Investigated whether existing MCG measurement requirements apply for the MCG when the SCG is deactivated.

**Issue 3-1-4: SCG deactivation delay requirement when one or more Scells in SCG are active or dormant.**

* Proposals
  + Option 1 (Nokia): RAN4 will need to define requirement for SCG deactivation delay requirement when one or more Scells in SCG are active or dormant [R4-2111283 Obs8]

Please proponent elaborate the scenario and justification of the issue (Please see the comments in the 1st round.).

**Issue 3-1-5: Additionally define minimum delay requirements for direct activation of SCG**

* Proposals
  + Option 1 (Nokia): RAN4 should additionally define minimum delay requirements for direct activation of SCG [R4-2111283 Obs9]

Please proponent elaborate the scenario and justification of the issue (Please see the comments in the 1st round.).

**Issue 3-1-8: Reduced physical layer processing delay for SCG activation use case**

* Proposals
  + Option 1 (Nokia): RAN4 to discuss defining reduced physical layer processing delay for SCG activation use case [R4-2111283 Obs12].

### CRs/TPs

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

*Note: The tdoc decisions shall be provided in Section 3 and this table is optional in case moderators would like to provide additional information.*

|  |  |
| --- | --- |
| **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 3-1-1: RRM measurement on PSCell after SCG deactivation**

* Proposals
  + Option 1: L3 measurement requirements on deactivated PSCell are supposed to be discussed

- Option 1b: RAN4 should develop reporting requirements for deactivated PSCell (Nokia)

- Option 1c: RAN4 should develop measurement accuracy requirements for deactivated SCG (Nokia)

**Issue 3-1-2: MCG measurement requirements**

* Proposals
  + Option 1: Investigated whether existing MCG measurement requirements apply for the MCG when the SCG is deactivated.

**Issue 3-1-4: SCG deactivation delay requirement when one or more Scells in SCG are active or dormant.**

* Proposals
  + Option 1 (Nokia): RAN4 will need to define requirement for SCG deactivation delay requirement when one or more Scells in SCG are active or dormant [R4-2111283 Obs8]

**Issue 3-1-5: Additionally define minimum delay requirements for direct activation of SCG**

* Proposals
  + Option 1 (Nokia): RAN4 should additionally define minimum delay requirements for direct activation of SCG [R4-2111283 Obs9]

**Issue 3-1-8: Reduced physical layer processing delay for SCG activation use case**

* Proposals
  + Option 1 (Nokia): RAN4 to discuss defining reduced physical layer processing delay for SCG activation use case [R4-2111283 Obs12].

**Companies views’ collection for 2nd round**

|  |  |
| --- | --- |
| **Company** | **Comments** |
|  | **Issue 3-1-1: RRM measurement on PSCell after SCG deactivation**  **Issue 3-1-2: MCG measurement requirements**  **Issue 3-1-4: SCG deactivation delay requirement when one or more Scells in SCG are active or dormant.**  **Issue 3-1-5: Additionally define minimum delay requirements for direct activation of SCG**  **Issue 3-1-8: Reduced physical layer processing delay for SCG activation use case** |
| Apple | **Issue 3-1-1: RRM measurement on PSCell after SCG deactivation**  Comments to option 1b: could this be covered by existing inter-frequency measurement reporting requirements?  Comments to option 1c: whether we could reuse existing requirements?  **Issue 3-1-2: MCG measurement requirements**  Issue is not clear to us now. FFS.  **Issue 3-1-4: SCG deactivation delay requirement when one or more Scells in SCG are active or dormant.**  FFS. E.g. e.g. what is supported status of other Scells in SCG upon deactivation?  **Issue 3-1-5: Additionally define minimum delay requirements for direct activation of SCG**  Better not conclude this until the procedure becomes clear.  **Issue 3-1-8: Reduced physical layer processing delay for SCG activation use case**  Is this in RAN4 scope? |
| H*uawei* | **Issue 3-1-1: RRM measurement on PSCell after SCG deactivation**  Needs some clarification on option 1b. Does reporting requirements mean measurement period or event trigger reporting like section 9.2.4?  Regarding option 1c, the justification of changing accuracy is not observed.  **Issue 3-1-2: MCG measurement requirements**  We think existing MCG measurement requirements can be applied for the MCG when the SCG is deactivated. Ok to further check.  **Issue 3-1-4: SCG deactivation delay requirement when one or more Scells in SCG are active or dormant.**  Not sure whether this requirement needs to be specified.  When the target MN indicate the SCG state as “deactivated”, the whole SGC including PSCell, active Scells and dormant Scells enters to “deactivated” state. The UE behaviour, in our understanding, is turning off RF. This is the same as Scell deactivation procedure. And for Scell deactivation requirements, there is no difference between one Scell and multiple Scells deactivations.  **Issue 3-1-5: Additionally define minimum delay requirements for direct activation of SCG**  Needs clarification on what is “direct activation of SCG’.  In our understanding, if target MN indicate the SCG state as “activated”,  - PSCell is always activated  - Scell is deactivated (for default) or “direct activated” (R16 Scell direct activation),  We think there are requirements in R15/R16 for the above behaviour. We don’t understand what kind of “additional” requirements shall be considered here.  **Issue 3-1-8: Reduced physical layer processing delay for SCG activation use case**  Have the same concern as Apple. Is it in the WI scope? |
| Ericsson | **Issue 3-1-1: RRM measurement on PSCell after SCG deactivation**  We support Option 1.  **Issue 3-1-2: MCG measurement requirements**  We support Option 1.  **Issue 3-1-4: SCG deactivation delay requirement when one or more Scells in SCG are active or dormant.**  We would like to rephrase this into “Investigate whether RAN4 will need to define requirement for SCG deactivation delay requirement when one or more Scells in SCG are active or dormant.”  The reason is that today, there is no difference between activation delay of single Scell (8.3.3) and multiple Scells (8.3.8). So it is not clear that such equirements are needed. Therefore “RAN4 will need to define...” is too strong.  **Issue 3-1-5: Additionally define minimum delay requirements for direct activation of SCG**  We would like to rephrase this into “Investigate whether RAN4 should additionally define minimum delay requirements for direct activation of SCG.”  It is not clear here what direct activation would mean, to start with. In legacy, PSCell is always directly activated at addition. Is the intention here that when UE gets the RRC configuration for SCG with PSCell in activte state (i.e. legacy behaviour), there would also be one or more Scells that are added in active state? We can discuss further the different scenarios, but at this point we think “RAN4 should additionally define...” is a little strong (although *should* is weaker than e.g. *shall*).  **Issue 3-1-8: Reduced physical layer processing delay for SCG activation use case**  We agree with Option 1. Deactivated SCG should be quite similar to deactivated Scell, i.e., SW is already loaded, memory is already allocated, etc. So there should be opportunities for trimming the individual timeline contributors compared e.g. to PSCell addition or PSCell change scenarios. |

# Topic #4: Conditional PSCell change and addition

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [R4-2109222](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2109222.zip) | Intel Corporation | Observation: RRM impacts in Rel-17 are related to support of conditional PSCell addition, support for FR2 target cell and any potential enhancements in inter-SN PSCell change procedure, which are all subject to RAN2 design.  Proposal 6: Use previous RRM requirements for PSCell addition and change as the baseline for specifications of Rel-17 conditional PSCell addition and change. |
| R4-2110380 | Huawei, HiSilicon | Proposal 1: The inter-SN conditional PSCell change requirements can reuse the existing conditional PSCell change requirements specified in clause 8.11B.  Proposal 2: Conditional PSCell addition delay shall be specified.  Proposal 3: The RRM requirements of coexistence of CHO and CPAC are discussed until RAN2 has completed the concrete solutions. |
| R4-2111283 | Nokia, Nokia Shanghai Bell | Observation 15: RAN4 would need to define CPAC requirements including HO delay, Measurement time, Preparation time and Interruption time.  Observation 16: RAN4 need to develop the requirements for: FR1-FR1, FR1-FR2, FR2-FR1 and FR2-FR2. |

## Open issues summary

### Sub-topic 4-1: General RRM impact

This sub-topic intends to identify the RRM impact due conditional PSCell change and addition (CPCA).

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| --- |
| *Background*   1. *Rel-16 scope was only to introduce intra-SN conditional PSCell change without MN involvement.* 2. *In TS38.133, the requirements for conditional PSCell change are specified in clause 8.11B.* |

**Issue 4-1-1: Inter-SN conditional PSCell change requirements**

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| --- |
| *For information*  *In R17 RAN2 focus on CPA(Conditional PSCell Addition) and inter-SN CPC (Conditional PSCell Change) where both NR-DC and (ng)EN-DC deployment scenarios are considered, that is:*  *- Conditional PSCell addition*  *- MN initiated Inter-SN conditional PSCell change*  *- SN initiated Inter-SN conditional PSCell change* |

* Proposals
  + Option 1 (Huawei): The inter-SN conditional PSCell change requirements can reuse the existing conditional PSCell change requirements specified in clause 8.11B.
* Recommended WF
  + Further discussion

**Issue 4-1-2: Conditional PSCell addition delay**

* Proposals
  + Option 1(Intel, Huawei, Nokia): RAN4 would need to define PSCell addition delay
* Recommended WF
  + Further discussion

**Issue 4-1-3: Develop related requirements for: FR1-FR1, FR1-FR2, FR2-FR1 and FR2-FR2**

* Proposals
  + Option 1(Nokia): RAN4 would need to define PSCell addition delay Option 2 RAN4 need to develop the requirements for: FR1-FR1, FR1-FR2, FR2-FR1 and FR2-FR2.
* Recommended WF
  + Further discussion

**Issue 4-1-4: Deprioritize coexistence of CHO and CPAC**

* Proposals
  + Option 1(Huawei): Deprioritize the discussion on the RRM requirements of coexistence of CHO and CPAC, until RAN2 has completed the concrete solutions.
* Recommended WF
  + Further discussion

#### Companies views’ collection for 1st round

**Sub-topic 4-1: General RRM impact**

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Qualcomm | **Issue 4-1-1: Inter-SN conditional PSCell change requirements**  Needs a further study/investigation. Agree that it can be served as a baseline for requirement development.  **Issue 4-1-2: Conditional PSCell addition delay**  Okay with Option 1.  **Issue 4-1-3: Develop related requirements for: FR1-FR1, FR1-FR2, FR2-FR1 and FR2-FR2**  For FR combination, needs a further discussion.  **Issue 4-1-4: Deprioritize coexistence of CHO and CPAC**  Okay with Option 1 in principle. |
| Ericsson | **Issue 4-1-1: Inter-SN conditional PSCell change requirements**  This is FFS  **Issue 4-1-2: Conditional PSCell addition delay**  Fine with Option 1.  **Issue 4-1-3: Develop related requirements for: FR1-FR1, FR1-FR2, FR2-FR1 and FR2-FR2**  OK to develop requirements. FR cases FFS.  **Issue 4-1-4: Deprioritize coexistence of CHO and CPAC**  Fine with Option 1, i.e., to wait with such discussions until RAN2 has provided a framework. |
| Intel | **Issue 4-1-1: Inter-SN conditional PSCell change requirements**  This is subject to RAN2 design.  **Issue 4-1-2: Conditional PSCell addition delay**  Fine with Option 1.  **Issue 4-1-3: Develop related requirements for: FR1-FR1, FR1-FR2, FR2-FR1 and FR2-FR2**  Agree with the proposal. One additional thing regarding target FR2 cell is that we are missing PSCell addition and conditional PSCell change requirements towards FR2 cell. RAN4 needs to define requirements for those.  **Issue 4-1-4: Deprioritize coexistence of CHO and CPAC**  Agree. It is subject to RAN2. |
| Huawei | **Issue 4-1-1: Inter-SN conditional PSCell change requirements**  Support option 1.  At the initial discussion of Rel-16, all scenarios for conditional PSCell change were considered in RAN2. Due to the WI time limitation, Rel-16 scope was narrowed down only to introduce intra-SN conditional PSCell change without MN involvement. In R16 RRM specification, the requirements for conditional PSCell change are specified in Ts38.133 clause 8.11B.  From RAN4 RRM perspective, there is no difference for inter-SN or intra-SN conditional PSCell change requirements.  **Issue 4-1-2: Conditional PSCell addition delay**  Support Option 1.  **Issue 4-1-3: Develop related requirements for: FR1-FR1, FR1-FR2, FR2-FR1 and FR2-FR2**  Need further discussion. Can use as a starting point.  **Issue 4-1-4: Deprioritize coexistence of CHO and CPAC**  Support option 1. RAN2 think the coexistence can be discussed in a later stage when time allows. |
| Apple | **Issue 4-1-1: Inter-SN conditional PSCell change requirements**  Option 1 seems ok. If companies identify any issue, we are open to further discussion.  **Issue 4-1-2: Conditional PSCell addition delay**  Support option 1.  **Issue 4-1-3: Develop related requirements for: FR1-FR1, FR1-FR2, FR2-FR1 and FR2-FR2**  FR combination may need further discussion.  **Issue 4-1-4: Deprioritize coexistence of CHO and CPAC**  Support option 1 in principle. |
| Nokia | **Issue 4-1-1: Inter-SN conditional PSCell change requirements**  Agree that RAN4 should develop UE requirements according to the RAN2 agreements and within the scope. However, we’re fine to further discuss option 1 during the work.  **Issue 4-1-2: Conditional PSCell addition delay**  Support option 1.  **Issue 4-1-3: Develop related requirements for: FR1-FR1, FR1-FR2, FR2-FR1 and FR2-FR2**  Support option 1.  **Issue 4-1-4: Deprioritize coexistence of CHO and CPAC**  option 1 is fine. RAN4 can wait until RAN2 work has progressed. |
| Qualcomm | **Issue 4-1-1 and 4-1-3: FFS** |

## Summary for 1st round

### Open issues

**Issue 4-1-1: Inter-SN conditional PSCell change requirements**

*Majority companies agree with option 1. Some companies need further study.*

*No tentative agreements.*

*Candidate options:*

*Option 1: The inter-SN conditional PSCell change requirements can reuse the existing conditional PSCell change requirements specified in clause 8.11B.*

*Recommendations for 2nd round: Further discussion*

**Issue 4-1-2: Conditional PSCell addition delay**

*All companies support option 1.*

*Tentative agreements.*

*RAN4 need to define conditional PSCell addition delay*

*Recommendations for 2nd round: No further discussion*

**Issue 4-1-3: Develop related requirements for: FR1-FR1, FR1-FR2, FR2-FR1 and FR2-FR2**

*Majority company support need further discussion on the FR combination.*

*No tentative agreements.*

*Candidate options:*

*Option 1(Nokia): RAN4 would need to define PSCell addition delay Option 2 RAN4 need to develop the requirements for: FR1-FR1, FR1-FR2, FR2-FR1 and FR2-FR2.*

*Recommendations for 2nd round: Further discussion*

**Issue 4-1-4: Deprioritize coexistence of CHO and CPAC**

*All companies support option 1.*

*Tentative agreements.*

*Deprioritize the discussion on the RRM requirements of coexistence of CHO and CPAC, until RAN2 has completed the concrete solutions.*

*Recommendations for 2nd round: No further discussion*

### CRs/TPs

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

*Note: The tdoc decisions shall be provided in Section 3 and this table is optional in case moderators would like to provide additional information.*

|  |  |
| --- | --- |
| **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 4-1-1: Inter-SN conditional PSCell change requirements**

|  |
| --- |
| *For information*  *In R17 RAN2 focus on CPA(Conditional PSCell Addition) and inter-SN CPC (Conditional PSCell Change) where both NR-DC and (ng)EN-DC deployment scenarios are considered, that is:*  *- Conditional PSCell addition*  *- MN initiated Inter-SN conditional PSCell change*  *- SN initiated Inter-SN conditional PSCell change* |

* Proposals
  + Option 1 (Huawei): The inter-SN conditional PSCell change requirements can reuse the existing conditional PSCell change requirements specified in clause 8.11B.

**Issue 4-1-3: Develop related requirements for: FR1-FR1, FR1-FR2, FR2-FR1 and FR2-FR2**

* Proposals
  + Option 1(Nokia): RAN4 need to develop the requirements for: FR1-FR1, FR1-FR2, FR2-FR1 and FR2-FR2.

**Companies views’ collection for 2nd round**

|  |  |
| --- | --- |
| **Company** | **Comments** |
|  | **Issue 4-1-1: Inter-SN conditional PSCell change requirements**  **Issue 4-1-3: Develop related requirements for: FR1-FR1, FR1-FR2, FR2-FR1 and FR2-FR2** |
| Apple | **Issue 4-1-1: Inter-SN conditional PSCell change requirements**  Option 1 can be starting point. It can be revisited if issues identified in future.  **Issue 4-1-3: Develop related requirements for: FR1-FR1, FR1-FR2, FR2-FR1 and FR2-FR2**  Since this is the first RAN4 meeting, we would like to further study the issue. E.g. FR1-FR1 DC requirements are not complete in RRM. |
| Huawei | **Issue 4-1-1: Inter-SN conditional PSCell change requirements**  Could we agree that Option 1 can be starting point.  **Issue 4-1-3: Develop related requirements for: FR1-FR1, FR1-FR2, FR2-FR1 and FR2-FR2**  Need further check. |
| Ericsson | **Issue 4-1-1: Inter-SN conditional PSCell change requirements**  We can agree to use Option 1 as starting point.  **Issue 4-1-3: Develop related requirements for: FR1-FR1, FR1-FR2, FR2-FR1 and FR2-FR2**  OK to develop requirements. FR cases FFS. |
| OPPO | **Issue 4-1-1: Inter-SN conditional PSCell change requirements**  Fine with Option 1 as starting point.  **Issue 4-1-3: Develop related requirements for: FR1-FR1, FR1-FR2, FR2-FR1 and FR2-FR2**  Open to study. |

# Recommendations for Tdocs

## 1st round

**New tdocs**

|  |  |  |
| --- | --- | --- |
| **Title** | **Source** | **Comments** |
| WF on R17 Multi-RAT Dual-Connectivity enhancements | Huawei, HiSilicon |  |
| Reply LS on temporary RS for efficient SCell activation in NR CA | Huawei, HiSilicon | To: RAN\_1 |
|  |  |  |

## 2nd round

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| --- | --- | --- | --- | --- |
| **Tdoc number** | **Title** | **Source** | **Recommendation** | **Comments** |
| R4-210xxxx | CR on … | XXX | Agreeable, Revised, Merged, Postponed, Not Pursued |  |
| R4-210xxxx | WF on … | YYY | Agreeable, Revised, Noted |  |
| R4-210xxxx | LS on … | ZZZ | Agreeable, Revised, Noted |  |
|  |  |  |  |  |

Notes:

1. Please include the summary of recommendations for all tdocs across all sub-topics.
2. For the Recommendation column please include one of the following:
   1. CRs/TPs: Agreeable, Revised, Merged, Postponed, Not Pursued
   2. Other documents: Agreeable, Revised, Noted
3. Do not include hyper-links in the documents