**3GPP TSG RAN WG1 #102-e R1-200xxxx**

**E-Meeting, August 17th – 28th, 2020**

**Agenda Item: 8.13.3**

**Source: Moderator (Huawei)**

**Title: Summary of discussions on** **efficient activation/de-activation mechanism for SCells in NR CA**

**Document for: Discussion and Decision**

# Introduction

As per chairman’s guidance, three rounds with check points below are planned. This summary is for the first round and is expected to complete by Wednesday August 19th.

[102-e-NR-DSS-DC\_enh2-01] Email discussion/approval using the summary as a starting point, focusing on high-level aspects – Ravi (Ericsson) & Frank (Huawei)

* By 8/19 – Classification of high priority/medium priority items for this e-Meeting
* By 8/24 – high priority items
* By 8/27 - medium priority items

According to the contribution papers under agenda item 8.13.3 for efficient activation/de-activation mechanism for NR CA SCells, and in light of RAN1 task by WID RP-201040, all identified issues are summarized and listed in Section 3 to facilitate discussions. In section 2, discussion priority for those issues is addressed.

|  |
| --- |
| The objective of this work item is to specify enhancements to MR-DC related scenarios. At least the following topics should be considered in the work:   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 |

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# Summary of issues and priorities

According to all of companies’ contribution documents, all the issues includes six specific issues and nine general issues are summarized below, with more details in Section 3. As per chairman’s guidance, the priority of issues will be discussed first, and then focus on the high priority/medium priority items for this e-Meeting. Please companies provide your views at least for this section by 18:00 PST Tuesday, August 18 (UTC 01:00, August 19).

For the specific issues to activation/deactivation process:

* **Issue-1:** Triggering command for SCell activation/de-activation
* **Issue-2:** The functionality of temporary RS during the SCell activation
* **Issue-3:** Candidate RS for the temporary RS
* **Issue-4:** Triggering command for temporary RS
* **Issue-5:** Tactivation reduction with BS assistance but no temporary RS nor SSB
* **Issue-6**: Enhancement for CSI reporting

Please feedback either “No need”, “Low”, “Medium” or “High” as priority for the following issues. Your simple justification for it is welcome with details left to Section 3.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| *Company* | *Issue-1* | *Issue-2* | *Issue-3* | *Issue-4* | *Issue-5* | *Issue-6* |
| Futurewei | Medium | High | Medium | High | High | Medium |
| MTK | Medium | High | High | High | Medium | Medium |
| ZTE | Medium | High | High | Medium | Low | Low |
| Nokia | High | High | High | Medium (triggering design is a detail to be discussed later) | Low | Low |
| Qualcomm | High | High | High | High | Medium | Medium |
| DOCOMO | High | High | High | High | Medium | Medium |
| Ericsson | Medium | High | High | Low (can be discussed after determining functionality etc. i.e., Issue 2, Issue 3) | Medium (should also check with RAN4) | Low |
| Samsung | High | High | High | High | Medium | Medium |
| CATT | High | High | Medium | Medium | Medium | Low |
| vivo | Low | High | High | Medium | Low | Low |
| Huawei, HiSilicon | High | High | High | Medium | High | Medium |
| <In Total> | 6H4M1L | 11H | 9H2M | 5H5M1L | 2H6M3L | 6M5L |

For general issues, they are translated as ‘Yes/NO’ questions for your convenience, which each is basically extracted from a proposal of one company:

* **Question G1:** Whether or not should RAN1 consider at least the cases of FR1 unknown cell and FR2 unknown cell, if RAN1 decides to design temporary RS to assist fast SCell activation? [3]
* **Question G2:** Whether or not can UE measure the triggered RS on the BWP indicated by “firstActiveDownlinkBWP-Id” although the BWP is inactive during Scell activation procedure? [1]
* **Question G3:** Whether the accurate timing for SCell activation should be clarified or not [4], i.e. after which time points of time point#1, #2 and #3 in the Figure 1 of [4] is the to-be-activated SCell regarded as activated?
* **Question G4:** Whether or not RAN1 starts the corresponding work only after RAN4 firstly estimate to what extent the delay for activation/deactivation could be reduced and potential improvement, e.g. extra information/assumption, required to reduce the delay?[12]
* **Question G5:** Whether or not in this WI RAN1 to identify and resolve any issue related to simultaneous operation of SCell dormancy and secondary DRX group? [9]
* **Question G6:** Whether or not in this WI RAN1 to consider extending the SCell dormancy mechanism to more efficiently support the SCG dormancy?[9]
* **Question G7:** Whether RAN1 should not work on an enhancement for SCell activation/de-activation for NR-CA with putting aside SCell dormancy? [13]
* **Question G8:** For SCell dormancy, whether is it unnecessary or not to re-open the discussions for the features that were not supported in Rel.16, unless other factors (e.g., SCG suspension) are to be taken into account? [13]
* **Question G9:** Whether or not RAN1 need to further study scenarios, if any, in which gNB knowledge of TCI-state or SSB index for a Scell activation may not be clear enough, such as inter-band CA? [5]

Please feedback either “No need”, “Low”, “Medium” or “High” as priority for the following questions. Your simple justification for it is welcome with details left to Section 3.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *Company* | *Question G1* | *Question G2* | *Question G3* | *Question G4* | *Question G5* | *Question G6* | *Question G7* | *Question G8* | *Question G9* |
| Futurewei | No need | Yes | High | No need | No need | No need | High | No need | Medium |
| MTK | High | High | Medium | Low | Low | Low | Medium | Low | Low |
| ZTE | Medium | High | Low | No need | No need | No need | No need | No need | Medium |
| Nokia | Medium | High | High | Medium | Low | Very low | FL question unclear | FL question unclear | Medium |
| Qualcomm | FFS | Yes | Clear | Clear | FFS | Yes | High | Yes | FFS |
| DOCOMO | High | High | Medium | Low | Low | Low | Medium | Low | Medium |
| Ericsson | Medium | Medium | Medium | Medium | Medium | Low (RAN2 discussion) | FL question unclear | Low | Medium |
| Samsung | Medium | Medium | Medium | No need | No need | No need | Medium | No need | No need |
| CATT | Not sure the intention. The temporary RS is applicable to all the cases or design different RS for unknown/known cell case? | High | High | No need | No need | No need | Low | Low | Low |
| vivo | Medium | High | Low | No need | No need | No need | No need | No need | No need |
| Huawei, HiSilicon | Medium | High | Medium | No need | No need | No need | No need | No need | No need |
| <In Total> | 2H6M1N | 7H2M | 3H5M2L | 2M2L6N | 1M3L6N | 4L6N | 2H3M1L3N | 4L5N | 5M2L3N |

In summary, classification of high priority/medium priority items for this e-Meeting

* High priority:
  + Issue-2: The functionality of temporary RS during the SCell activation
  + Issue-3: Candidate RS for the temporary RS
  + Question G2: Whether or not can UE measure the triggered RS on the BWP indicated by “firstActiveDownlinkBWP-Id” although the BWP is inactive during Scell activation procedure?
* Medium priority:
  + Issue-4: Triggering command for temporary RS
  + Issue-1: Triggering command for SCell activation/de-activation
  + Issue-5: Tactivation reduction with BS assistance but no temporary RS nor SSB
  + Question G1: Whether or not should RAN1 consider at least the cases of FR1 unknown cell and FR2 unknown cell, if RAN1 decides to design temporary RS to assist fast SCell activation?
  + Question G3: Whether the accurate timing for SCell activation should be clarified or not [4], i.e. after which time points of time point#1, #2 and #3 in the Figure 1 of [4] is the to-be-activated SCell regarded as activated?
  + Issue-6: Enhancement for CSI reporting
* Low priority:
  + Question G4: Whether or not RAN1 starts the corresponding work only after RAN4 firstly estimate to what extent the delay for activation/deactivation could be reduced and potential improvement, e.g. extra information/assumption, required to reduce the delay?
  + Question G5: Whether or not in this WI RAN1 to identify and resolve any issue related to simultaneous operation of SCell dormancy and secondary DRX group?
  + Question G6: Whether or not in this WI RAN1 to consider extending the SCell dormancy mechanism to more efficiently support the SCG dormancy?
  + Question G7: Whether RAN1 should not work on an enhancement for SCell activation/de-activation for NR-CA with putting aside SCell dormancy?
  + Question G8: For SCell dormancy, whether is it unnecessary or not to re-open the discussions for the features that were not supported in Rel.16, unless other factors (e.g., SCG suspension) are to be taken into account?
  + Question G9: Whether or not RAN1 need to further study scenarios, if any, in which gNB knowledge of TCI-state or SSB index for a Scell activation may not be clear enough, such as inter-band CA?

# Discussions

In current specifications, when a UE receives a SCell activation command in a PDSCH in slot , the UE shall complete SCell activation no earlier than and no later than slot *n*+ [*THARQ* + *Tactivation\_time* + *TCSI\_Reporting*]/ as shown in Figure 1. Therefore, reducing *THARQ*, *Tactivation\_time* and *TCSI\_Reporting* is the key to achieve efficient SCell activation/de-activation mechanism. Companies’ views are summarized in the sections below. In addition to your feedback to Section 2, more detailed comments are welcome.



Figure 1 SCell activation procedure

## THARQ reduction

### Issue-1: Triggering command for SCell activation/de-activation

RAN1 can further develop the signaling for SCell activation/de-activation, Some companies share views on this open issue and can be generally summarized as follows:

* Opt 1.1 reusing current MAC CE(only for SCell activation) [12]
* Opt 1.1a MAC CE (triggering for both SCell activation and temporary RS) [2]
* Opt 1.2 DCI (triggering only for SCell activation) [11][12]
* Opt 1.2a DCI (both for SCell activation and temporary RS) [2]

**Question 1: Which triggering command for SCell activation/de-activation is preferable, i.e. whether MAC CE is sufficient or DCI-based triggering should be supported in this WI? Whether the triggering of temporary RS, if introduced, is integrated with SCell activation/deactivation trigger?**

Companies’ views are very welcome.

|  |  |
| --- | --- |
| *Company* | *View* |
| Futurewei | 1.2a (the DCI may be the trigger of the temporary RS, which also serves as the SCell activation command; see [15]); 1.1a |
| MTK | Opt 1.1a and 1.2a seem to have better efficiency. But we do not have strong view on this issue. |
| Nokia | Option 1.1b: New/rehashing of the current MAC CEpreferred for triggering temporary RS. |
| Qualcomm | If we continue working on the Rel.16 left-over fast SCell activation, we prefer to consider DCI triggering for temporary RS (Opt 1.2 or Opt 1.2a). |
| DOCOMO | We prefer Opt 1.2 or 1.2a, depending on details of temporary RS. |
| Samsung | 1.2a  Given that the objective is to minimize SCell activation time, there is no motivation to use MAC CE and not re-use the SCell dormancy indication mechanism. |
| CATT | We prefer 1.2a |
| vivo | Opt 1.1: The current MAC CE is enough for SCell activation. A new MAC CE is defined for triggering temporary RS. |
| Huawei, HiSilicon | 1.1a and 1.2a are preferable |

## Tactivation reduction

### Temporary RS based

#### Issue-2: The functionality of temporary RS during the SCell activation

In current specifications, SSB is used for cell search, AGC settling and time/frequency tracking, CSI-RS is used for CSI reporting during SCell activation procedure. If temporary RS is introduced, it is interest to determine which functionality should be provided by temporary RS in order to reduce activation delay. Companies’ views on it are summarized as follows:

* Opt2.1 AGC settling[1][2][3][6][10][14]
* Opt2.2 Time/frequency tracking[1][2][4][5][6][10][14]
* Opt2.3 CSI measurement[4][6]
* Opt2.4 Cell search[3]

“*For the SCell activation time of FR1/FR2 unknown cell, the dominant term comes from the operation of AGC gain setting (part D in Figure 1 and 3) and cell search (part E in Figure 1 and 3)*”[3].

**Question 2-1: Whether should a temporary RS be supported for Tactivation reduction?**

Companies’ views are very welcome.

|  |  |
| --- | --- |
| *Company* | *View* |
| Futurewei | Yes |
| MTK | Yes |
| Nokia | Yes, for purpose of 2.1 and 2.2 only. |
| Qualcomm | For fast SCell activation, yes. |
| DOCOMO | Yes |
| Samsung | Yes |
| CATT | Yes |
| vivo | Yes. |
| Huawei, HiSilicon | Yes |

**Question 2-2: Which functionality above should be provided by temporary RS during the SCell activation?**

Companies’ views are very welcome.

|  |  |
| --- | --- |
| *Company* | *View* |
| Futurewei | 2.1, 2.2, 2.3. In addition, if A-SRS is triggered as a temporary RS, the A-SRS can provide functionalities such as UL TA acquisition, UL/DL CSI acquisition, etc. |
| MTK | 2.1, 2.2, 2.4. These three terms deem to be dominant according to our analysis in [3] based on current 38.133 spec description for SCell activation time. |
| Nokia | We see Opt2.2 being the primary target of the temporary RS, but AGC settling (2.1) may well be something the implementations use the temporary RS for, but this opportunity is not expected to impact the specification. We don’t see the need to use temporary RS for CSI measurements or cell search. |
| Qualcomm | At least 2.1 and 2.2. The temporary RS is used as an alternative RS to the SSB during the SCell activation. Therefore, it should play a role as an SSB for the SCell activation procedure.  For unknown cell, cell search would be one of dominant factors. However, it is not clear whether the unknown cell is the scenario we should optimize for, and further discussion is necessary. |
| DOCOMO | 2.1 and 2.2 should be at least considered. 2.3 and 2.4 are FFS. |
| Samsung | 2.1, 2.2, 2.3. A-SRS can also be considered as most NR bands are TDD. MIMO Rel-17 is considering similar mechanisms and the WIs may align. |
| vivo | Opt 2.1 and 2.2 for both known and unknown cells. Opt 2.4 can be considered for unknown cell. |
| Huawei, HiSilicon | 2.1, 2.2, 2.3 are supported as least, FFS 2.4 |

**Possible proposal 2**:

*Temporary RS is supported for SCell activation:*

* *The temporary RS should provide at least the functionalities of AGC settling and time/frequency tracking.*
* *FFS potential functionalities of CSI measurement/acquisition and cell search*

#### Issue-3: Candidate RS for the temporary RS

If temporary RS is introduced, the RS candidates can be Rel15/16 RS, e.g. A-TRS, SP CSI-RS, aperiodic CSI-RS, SP TRS, etc. Companies’ views are summarized as follows:

* Opt 3.1 TRS [2]
  + Opt 3.1.1 aperiodic TRS [1][5][10]
* Opt 3.2 aperiodic CSI RS [7]
* Opt 3.3 short interval P/SP-CSI RS [6][8][14]

**Question 3: Which RS above should be selected as the temporary RS to provide the functionalities in question 2-2? Your views on benefit/gain, specification impact, implementation complexity are encouraged.**

Companies’ views are very welcome.

|  |  |
| --- | --- |
| *Company* | *View* |
| Futurewei | 3.3, 3.2, 3.1.1, and possibly A-SRS |
| MTK | Opt 3.1 and possibly PSS/SSS since they can carry cell ID to aid cell search |
| Nokia | 3.1.1. Aperiodic tracking RS (A-TRS) as candidate for temporary RS. |
| Qualcomm | Aperiodic TRS/CSI-RS (Opt 3.1.1 or Opt 3.2) would be desirable. |
| DOCOMO | Opt 3.1 (3.1.1) or Opt 3.2 should be considered. |
| Samsung | 3.2 (or 3.1.1), As long as we focus on the temporary RS, it should be based on aperiodic CSI-RS. We do not prefer to introduce additional type of CSI-RS. In addition, aperiodic CSI-RS can cover all the things that can be achieved by aperiodic TRS thanks to its full flexibility in configuration. But, we are also OK with aperiodic TRS due to its UE-friendly structure. |
| vivo | Opt 3.1.1.  Aperiodic CSI-RS does not provide any QCL-A parameters, while short interval P/SP TRS or CSI-RS causes large overhead for SCell. |
| Huawei, HiSilicon | 3.3 are preferable, short interval P/SP-CSI RS has little impact on spec, 3.1.1 is also ok to us. |

**Possible proposal 4:**

*Aperiodic TRS is selected as temporary RS for Scell activation*

* *If more functionalities are confirmed to be supported by temporary RS, other RS candidates, i.e. aperiodic CSI RS and P/SP-CSI RS, are not precluded.*

#### Issue-4: Triggering command for temporary RS

If temporary RS is introduced, the triggering command for the temporary RS should be discussed. Companies’ views with respect to different types of proposed temporary RS are summarized as follows:

* Opt4.1 A-CSI-RS
  + Opt4.1.1 DCI [7]
* Opt4.2 A-TRS
  + Opt4.2.1 new MAC CE [1][5]
  + Opt4.2.2 DCI[4]
* Opt4.3 TRS
  + Opt4.3.1 MAC CE (both for temporary RS and SCell activation)[2]
  + Opt4.3.2 DCI (both for temporary RS and SCell activation)[2]

**Question 4: Depending on the outcome of Q1 and Q3, but companies’ views on above options are welcome, especially which options have unique advantage in term of benefit/gain, specification impact, implementation complexity?**

Companies’ views are very welcome.

|  |  |
| --- | --- |
| *Company* | *View* |
| Futurewei | DCI as triggering command. 4.3.2 for A-TRS, 4.3.1 for A-TRS, or A-SRS DCI for A-SRS triggering and SCell activation |
| MTK | Opt4.2.1 and Opt4.2.2. We want to further elaborate that the listed triggering command can also work for PSS/SSS as temporary RS. |
| Nokia | 4.2.1 Current MAC-CE command SCell activation procedures should serve as baseline for discussion, because Scell activation procedures are based on it in R15, such the specification effort can be substantially reduced. Temporary RS trigger functionality should be part of new MAC-CE or added to the same MAC-CE command used to activate SCell.  Therefore, whether new or modified MAC-CE is FFS. |
| Qualcomm | We would like to see Opt 4.1.1, Opt 4.2.2, or Opt 4.3.2. |
| DOCOMO | We prefer Opt 4.1.1, 4.2.2 or 4.3.2. |
| Samsung | DCI as triggering command. Opt 4.1.1, Opt 4.2.2 |
| vivo | For A-TSR, our 1st preference is opt4.2.1, as the MAC CE can be more flexible than DCI. Opt4.2.2 is our 2nd choice. |
| Huawei, HiSilicon | This issue can be discussed based on the outcome of Issue-1 and Issue-3. |

### The To-be-activated cell acquires essential information for activation enhancement from active cell

#### Issue-5: Tactivation reduction with BS assistance but no temporary RS nor SSB

It is proposed in [14] that activation time of the To-be-activated cell can be reduced by acquiring activation information (e.g. synchronization and AGC-related information) from active cell(s) which are co-located with the To-be-activated cell and even may be sharing the same BS hardware with it, e.g. the same RF module. For example, the BS provides a UE the information of co-located reference active cells to assist the activation of the To-be-activated cell, which may speed up the procedure of synchronization and AGC.

**Question 5: Whether is BS assistance information (e.g. information based on reference active cells) useful for Tactivation reduction?**

Companies’ views are very welcome.

|  |  |
| --- | --- |
| *Company* | *View* |
| Futurewei | Yes. It is useful to specify network assistance signaling to the UE about the side information on the to-be-activated SCell to reduce the latency [15]. |
| MTK | It may be helpful, needs further discussion. |
| Nokia | This could be considered if SSB-less SCell is supported also in FR1 by chipsets. In our understanding, SSB-less Scell is allowed by RAN4 in FR2 intra-band CA only at the moment. |
| Qualcomm | Could be useful, but this would need RAN4’s help. |
| DOCOMO | It should be further discussed. |
| Samsung | Neutral. Further study on its benefit is needed. |
| vivo | It may be useful but only in a specific deployment. Solutions for more general use cases should be discussed first. |
| Huawei, HiSilicon | Yes, it can reduce more latency compared with temporary RS in some specific scenarios. |

## TCSI\_reporting reduction

### Issue-6: Enhancement for CSI reporting

How to reduce the TCSI\_reporting is also a key to achieve efficient SCell activation. Companies’ views are summarized as follows:

* Opt 6.1 reusing R15/R16 framework, including RS and CSI reporting mechanism [5]
* Opt 6.2 PUCCH-based reporting for A-CSI [7]

“*Enhancing the A-CSI measurement and reporting framework can enhance SCell activation by reducing a corresponding delay. To enable A-CSI measurement/reporting for a deactivated SCell, a triggering method using group-common DCI (i.e., non-scheduling DCI) can be considered. In NR Rel-16, an A-CSI report is conveyed by PUSCH and cannot be provided via PUCCH. For a deactivated SCell, it is not possible to report A-CSI by PUSCH. Therefore, PUCCH-based reporting for A-CSI should be supported.*”[7]

* Opt 6.3 short interval P/SP- CSI-RS report [8][14]

“*The specific P/SP-CSI-RS/reporting for SCell activation can be received during the required period. This short interval P/SP-CSI-RS/reporting for fast SCell activation is beneficial with little specification impacts.*”[8]

* Opt 6.4 remove TCSI\_reporting for the case of FR2 unknown cell[14]

“*During the procedure of SCell activation, when gNB receives the beam reporting, i.e. the L1-RSRP report, it implies that UE has completed beam selection and timing synchronization which are necessary conditions for downlink transmission. It means that gNB can start downlink transmission with a conservative or rough MCS on the SCell, and UE can start to monitor PDCCH on the SCell, even the valid CSI report is not yet reported. Thus the gNB and UE can assume the SCell is activated after the Tactivation\_time.*”[14]

* Opt 6.5 triggering UL SRS for CSI acquisition

**Question 6: which option above of CSI reporting enhancement should be supported?**

Companies’ views are very welcome.

|  |  |
| --- | --- |
| *Company* | *View* |
| Futurewei | Opt 6.5 and 6.3 |
| MTK | To our understanding, TCSI\_reporting is not the dominant term for SCell activation. So, we prefer Opt 6.1. |
| Nokia | 6.1 For acquisition of CSI after activation reuse R15/R16 framework, including RS and CSI reporting mechanism. Synchronization part should be prioritized, and CSI enhancements should be of second priority. |
| Qualcomm | We are open for further discussion. We should study the whole procedure until the SCell becomes actually usable. |
| DOCOMO | First, it should be studied on the impact on SCell activation delay. |
| Samsung | Opt 6.2 and 6.5 |
| vivo | Opt 6.1 is our preference.  Opt 6.2 seems to introduce lots of spec changes, but the gain is not significant compared with others  Opt 6.3 increases significantly the system overhead.  Opt 6.4 may be beneficial only for a specific deployment. |
| Huawei, HiSilicon | 6.3 should be supported which can reduce the latency of CSI reporting and has little impact on the spec. 6.4 should be supported which can be applied to the FR2 unknown case. |

## General Issues

This section discusses the general issues for SCell activation/deactivation.

* **Question G1:** Whether or not should RAN1 consider at least the cases of FR1 unknown cell and FR2 unknown cell, if RAN1 decides to design temporary RS to assist fast SCell activation? [3]

Companies’ views are very welcome.

|  |  |
| --- | --- |
| *Company* | *View* |
| Futurewei | No need to consider such a case since basically initial cell acquisition is needed for an unknown SCell, which would take a long time anyway. The exception may be when the “unknown” SCell shares some properties (e.g., timing) with another known SCell and the UE can still assume some knowledge about the “unknown” SCell. |
| MTK | FR1 unknown cell and FR2 unknown cell are worst cases that require the longest SCell activation time. Hence, they should be considered if RAN1 decides to design temporary RS to assist fast SCell activation. How can we enhance a feature without enhancing the worst case? |
| ZTE | From our perspective, RAN1 should at least study the cases of FR1/FR2 known cell. If time allows, we can also study the cases of FR1/FR2 unknown cell. |
| Nokia | Medium (discuss later) This is related to question G9, with respect to whether gNB is aware of beam-pair for the cell or not. |
| Qualcomm | It is true that unknown cell is the worst case of the SCell activation latency. However, this does not mean that we should optimize the feature for this case. We need to understand whether there is actually a case where the UE has not measured the SCell to be activated (implying that the network perhaps would also not know the quality of the cell for the UE) but fast activation of the SCell is really necessary. |
| DOCOMO | At least RAN1 needs to study the case of an unknown SCell, considering the assumed gain and the drawback on potential solution. |
| Samsung | We assume that is the baseline. |
| CATT | Our understanding is that the temporary RS is applicable to both unknown cell and known cell scenarios. Our answer is yes. |
| vivo | It is beneficial to support fast activation also for unknown cell, but this can be the 2nd priority after the known cell case. |
| Huawei, HiSilicon | In our understanding, the cases for the combination of FR1, FR2, known cell and unknown are all included in the WID. |

* **Question G2:** Whether or not can UE measure the triggered RS on the BWP indicated by “firstActiveDownlinkBWP-Id” although the BWP is **inactive** during Scell activation procedure?[1]

Companies’ views are very welcome.

|  |  |
| --- | --- |
| *Company* | *View* |
| Futurewei | Yes. This helps reduce the latency. |
| MTK | Yes. This makes sense and reduces the latency. |
| ZTE | We need to define a BWP for the temporary RS. Regarding whether to apply the firstActiveDownlinkBWP or other BWP, we can further discuss this in next phase of detailed discussion. |
| Nokia | High: We believe TRS should be transmitted on firstActiveDownlinkBWP-Id which should be active already at n+K1+3ms |
| Qualcomm | For fast SCell activation, the procedure should enable this. |
| DOCOMO | Yes. It needs further discussion whether or not to use other BWP. |
| Samsung | Yes. |
| CATT | Yes |
| vivo | Yes. |
| Huawei, HiSilicon | Yes, and first Active Downlink BWP is preferable. |

**Possible proposal 8**:

*UEs measure the triggered temporary RS on an inactive BWP during Scell activation procedure:*

* *The inactive BWP can be indicated by “firstActiveDownlinkBWP-Id”.*
* *FFS whether the inactive BWP can be other BWP than the one above.*
* **Question G3:** Whether the accurate timing for SCell activation should be clarified or not [4], i.e. after which time points of time point#1, #2 and #3 in the Figure 1 of [4] is the to-be-activated SCell regarded as activated?

Companies’ views are very welcome.

|  |  |
| --- | --- |
| *Company* | *View* |
| Futurewei | Yes. This is essential to ensure the companies having a common understanding of “activation”. A change from legacy definition of activation can be supported but need to be clarified. |
| MTK | We think the current definition ” *THARQ* + *Tactivation\_time* + *TCSI\_Reporting*” for SCell activation time is clear. There is also a detailed timeline figure in our contribution [3]. However, we are open to discuss more if companies see the need. |
| ZTE | Based on our understanding, RAN4 has clearly defined that, the SCell activation procedure is considered as completed once the valid CSI report is reported. We are not sure about the motivation of changing this time point yet. Maybe the proponents can provide more details. |
| Nokia | High: At Point#1 |
| Qualcomm | Agree with MTK/ZTE that the current definition is clear. |
| DOCOMO | A common understanding would be needed. |
| Samsung | Yes. |
| CATT | Agree with Futurewei and DOCOMO that a common understanding is needed. What RAN4 defines is the maximum delay on the Scell activation procedure. However, when the behavior related to activated cell is defined in TS38.213, which is not that clear. The text highlighted with yellow is corresponding actions on an activated cell. The text highlighted with green defines a latest time point which means UE may or may not apply the actions corresponding to activated cell earlier.  With reference to slots for PUCCH transmissions, when a UE receives in a PDSCH an activation command [11, TS 38.321] for a secondary cell ending in slot *n*, the UE applies the corresponding actions in [11, TS 38.321] no later than the minimum requirement defined in [10, TS 38.133] and no earlier than slot , except for the following |
| vivo | We are not clear which parts of the timing is unclear and should be clarified. |
| Huawei, HiSilicon | Agree with MTK/ZTE. |

* **Question G4:** Whether or not RAN1 starts the corresponding work only after RAN4 firstly estimate to what extent the delay for activation/deactivation could be reduced and potential improvement, e.g. extra information/assumption, required to reduce the delay? [12]

Companies’ views are very welcome.

|  |  |
| --- | --- |
| *Company* | *View* |
| Futurewei | RAN1 can start the work, and in the meantime RAN1 should send LS to RAN4. |
| MTK | No, we are not even sure RAN4 would discuss the delay for activation/deactivation in the first week. |
| ZTE | RAN1 had some LS exchange with RAN4 on temporary RS during Rel-16. Based on the previous discussion outcome, we believe it is clear that temporary RS can offer much smaller SCell activation delay. Thus, we don’t think we need to discuss the above Question G4. |
| Nokia | Medium (discuss later): RAN4 previously said that RAN1 needs to design RS (A-TRS, A-NZP-CSI-RS, etc…), and then they can estimate delay. So this question is irrelevant at this stage.  LS: “RAN4 discussed question 1 and concluded that depending on the RS design, RAN4 expects that a considerable reduction in the SCell activation delay is possible if additional reference signals are provided to the UE immediately following the SCell activation command.” |
| Qualcomm | Either procedure would work, but given the WID states “RAN1 leading mechanisms”, it is more proper to initiate the work from RAN1 side. |
| DOCOMO | It would be better that RAN1 starts the work and LS can be sent if necessary. |
| Samsung | No need to wait for RAN4 |
| CATT | No need to wait for RAN4 |
| vivo | No. RAN1 can start the work in parallel with RAN4. |
| Huawei, HiSilicon | No need |

* **Question G5:** Whether or not in this WI RAN1 to identify and resolve any issue related to simultaneous operation of SCell dormancy and secondary DRX group? [9]

Companies’ views are very welcome.

|  |  |
| --- | --- |
| *Company* | *View* |
| Futurewei | No need. They are for different times. |
| MTK | Coupling theses 2 features would be complicated and does not have much gain justified. We see low priority. |
| ZTE | It seems this issue is out of the WI scope. Maybe it is better to clarify whether this issue within WI scope in RAN plenary first before we discuss this Question G5. |
| Nokia | Low: No, we should first focus on SCell activation command, and in later stage we can revisit this point. |
| Qualcomm | We are open for the discussion. |
| DOCOMO | We are open for the discussion. |
| Samsung | No need |
| CATT | No need |
| vivo | No, it is not in the scope according to the WID. |
| Huawei, HiSilicon | No need |

* **Question G6:** Whether or not in this WI RAN1 to consider extending the SCell dormancy mechanism to more efficiently support the SCG dormancy?[9]

Companies’ views are very welcome.

|  |  |
| --- | --- |
| *Company* | *View* |
| Futurewei | No need |
| MTK | No need, unless significant power saving gain is justified by some company. |
| ZTE | Based on our understanding, the motivation of this WI is to enable efficient SCell activation/deactivation. If we consider extending the SCell dormancy mechanism in this WI, it means the SCell is always in active state. Thus, currently, we think that extending the SCell dormancy mechanism is not in the scope of this WI. |
| Nokia | Very low: Not part of the WID |
| Qualcomm | Yes. Our original reading of the WID scope is more aligned with this. From the WID objective, what RAN1 need to do is to apply “efficient activation/de-activation mechanism for one SCG + SCells” to NR-CA, based on RAN1 leading mechanisms.  **Objective:**   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]   For this, RAN1 needs to see first how the efficient activation/deactivation for a SCG looks like. |
| DOCOMO | We are open for the discussion. |
| Samsung | No need |
| CATT | No need |
| vivo | No, it is not in the scope according to the WID. |
| Huawei, HiSilicon | No need |

* **Question G7:** Whether RAN1 should not work on an enhancement for SCell activation/de-activation for NR-CA with putting aside SCell dormancy? [13]

Companies’ views are very welcome.

|  |  |
| --- | --- |
| *Company* | *View* |
| Futurewei | RAN1 should work on enhancement for SCell activation/de-activation regardless, as NR SCell activation/de-activation is slower than LTE [15]. |
| MTK | We do not have strong view on this. |
| ZTE | We don’t need to discuss this issue. The main motivation of this WI to enable efficient SCell activation/deactivation. However, SCell dormancy is trying to keep SCell under active state. Thus, it seems the SCell dormancy is not in line with the current WI objective. |
| Nokia | Not sure we understand the question of FL, but dormancy should not be discussed under this AI |
| Qualcomm | We are OK to work on fast SCell activation using temporary RS, although we have not expected it.  However, improvement of the operation of SCell dormancy is also important. In particular, we see the need of enabling SRS transmission in a SCell with dormant BWP. This should also be supported as part of this WI. |
| DOCOMO | In our understanding, the objective of this WI is enhancements of SCell activation/de-activation independent from SCell dormancy/no SCell dormancy. Since dormant BWP is still SCell active as SCell state, and the enhancements in this WI and SCell dormancy can coexist. |
| Samsung | Fine to discuss. The additional benefits and use-cases should be well understood prior to proceeding to developing solutions. |
| CATT | Same views as ZTE |
| vivo | It is not necessary to restrict the work only with SCell dormancy. |
| Huawei, HiSilicon | The fast SCell activation should be discussed first. |

* **Question G8:** For SCell dormancy, whether is it unnecessary or not to re-open the discussions for the features that were not supported in Rel.16, unless other factors (e.g., SCG suspension) are to be taken into account? [13]

Companies’ views are very welcome.

|  |  |
| --- | --- |
| *Company* | *View* |
| Futurewei | No need |
| MTK | We see low priority to re-open the discussions, unless significant power saving/performance gain is justified by some company |
| ZTE | We don’t see the necessity to discuss this question.  The Rel-16 discussions can be the starting point for Rel-17 work. |
| Nokia | Not sure we understand the question from FL, but dormancy should not be discussed under this AI |
| Qualcomm | Same answer to G6. |
| DOCOMO | We are open for the discussion. |
| Samsung | No need – it is not relevant |
| CATT | No need |
| vivo | No. |
| Huawei, HiSilicon | No need |

* **Question G9:** Whether or not RAN1 need to further study scenarios, if any, in which gNB knowledge of TCI-state or SSB index for a Scell activation may not be clear enough, such as inter-band CA? [5]

Companies’ views are very welcome.

|  |  |
| --- | --- |
| *Company* | *View* |
| Futurewei | This can potentially reduce latency. Some RAN4 inputs may be needed. |
| MTK | If there is ambiguity identified, then it can be further discussed. |
| ZTE | We are open to discuss this issue in future meetings. |
| Nokia | Medium (discuss later): This is related to question of known and unknown cell G1, or scenario intra-band / inter-band CA, and whether in FR1 or FR2. We suggest, to start design with the assumption that gNB knows correct beam-pair for a UE on the SCell. |
| Qualcomm | For fast SCell activation, we should see the whole procedure, including TCI-state activation of the SCell. |
| DOCOMO | Need further discussion. |
| Samsung | No need |
| Huawei, HiSilicon | Open for further discussion |

## Other Issues

Issues or comments that do not fit in any of the previous sections of this document can be provided in this section.

|  |  |
| --- | --- |
| *Company* | *View* |
| Qualcomm | SRS transmission on a SCell with dormant BWP should also be considered. |
|  |  |
|  |  |
|  |  |

# Conclusions

[TBU]

**Possible FL conclusion:**

*Classification of high priority/medium priority items for this RAN1#102 e-Meeting*

* *High priority:*
  + *Issue-2: The functionality of temporary RS during the SCell activation*
  + *Issue-3: Candidate RS for the temporary RS*
  + *Question G2: Whether or not can UE measure the triggered RS on the BWP indicated by “firstActiveDownlinkBWP-Id” although the BWP is inactive during Scell activation procedure?*
* *Medium priority:*
  + *Issue-4: Triggering command for temporary RS*
  + *Issue-1: Triggering command for SCell activation/de-activation*
  + *Issue-5: Tactivation reduction with BS assistance but no temporary RS nor SSB*
  + *Question G1: Whether or not should RAN1 consider at least the cases of FR1 unknown cell and FR2 unknown cell, if RAN1 decides to design temporary RS to assist fast SCell activation?*
  + *Question G3: Whether the accurate timing for SCell activation should be clarified or not [4], i.e. after which time points of time point#1, #2 and #3 in the Figure 1 of [4] is the to-be-activated SCell regarded as activated?*
  + *Issue-6: Enhancement for CSI reporting*

#For High priority

**Possible proposal 1**:

*Temporary RS is supported for SCell activation:*

* *The temporary RS should provide at least the functionalities of AGC settling and time/frequency tracking.*
* *FFS potential functionalities of CSI measurement/acquisition and cell search*

**Possible proposal 2:**

*Aperiodic TRS is selected as temporary RS for Scell activation*

* *If more functionalities are confirmed to be supported by temporary RS, other RS candidates, i.e. aperiodic CSI RS and P/SP-CSI RS, are not precluded.*

**Possible proposal 3**:

*UEs measure the triggered temporary RS on an inactive BWP during Scell activation procedure:*

* *The inactive BWP can be indicated by “firstActiveDownlinkBWP-Id”.*
* *FFS whether the inactive BWP can be other BWP than the one above.*

#For Medium priority

[TBU]

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