**3GPP TSG-RAN WG1 #108-e R1-22xxxxx**

**eMeeting, Feb 21 – Mar 03, 2022**

**Source: Moderator (Ericsson)**

**Title: Summary#1 of Email discussion [108-e-NR-DSS-01]**

**Agenda item:** **8.13.1**

**Document for:** **Discussion and Decision**

# 1 Introduction

This document summarizes the discussions for email thread [108-e-NR-DSS-01] under agenda item 8.13.1 on Maintenance of Cross-carrier scheduling from SCell to PCell for the Rel17 WI on NR Dynamic spectrum sharing (DSS).

# 2. Discussion

## 2.1 Moderator Summary

Below is a short moderator summary based on tdocs [1-15] submitted for RAN1#108-e

### 2.1.1 PDCCH monitoring and BD/CCE limits

Aspects related to PDCCH monitoring and BD/CCE limit handling when CCS from sSCell to PCell/PSCell is configured

1. Values for scaling factor (i.e., RRC parameter *PCell-CCSscaling*)
   * [0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.8, 1] – [3]
   * [2/7,3/7,4/7,5/7,6/7, 1, reserved, reserved] – [6]
   * [1/8,2/8,3/8,4/8,5/8,6/8,7/8, reserved] – [9]
   * [1/7,2/7,3/7,1/2, 4/7, 9/14, 5/7,6/7] – [11]
   * [0.15, 0.22, 0.3, 0.43, 0.5, reserved, reserved, reserved] – [12]
   * [2/14, 3/14, 4/14, 5/14, 6/14, 8/14, 10/14, 12/14] – [13]
2. Clarification of [slot/symbol] for Type A UE in RAN1#105-e agreement
   * Search space sets on P(S)Cell and search space sets on sSCell are configured so that the UE does not monitor them in overlapping ~~[~~slot/~~symbol]~~ of P(S)Cell and sSCell
     + [2], [6],[10]
3. Handling of DCI format 2\_5 is same as in Rel16 – [3],[4],[5],[7],[15]
4. Additional values for s1, s2; additional scaling factor
   * Note: per RAN1#106bis-e agreement: P(S)Cell self-scheduling is counted by applying scaling factor s1 ; sSCell to P(S)Cell scheduling is counted additionally (assuming SCS of sSCell) by applying scaling factor s2; s1=1 and s2=0 agreed (current spec is based on those values). No additional values agreed in RAN1#107-e
   * No additional values for s1, s2 -- [3],[8]
   * s1=; s2=1- -- [1],[6]
     + Introduce additional BD/CCE limit split definitions corresponding to s1=; s2=1- as a UE capability – [1]
     + scaling factor is additionally supported; ‘s1=, s2=0’ – [6]
   * RRC configuration to select between (s1=1; s2=1) and already agreed (s1=1, s2=0) – [9]
   * Additional scaling factor configured via RRC – [9]
     + when is configured,
       - maximum number of PDCCH candidates for P(S)Cell scheduling on the P(S)Cell and on the sSCell as and , respectively
     + otherwise
       - maximum number of PDCCH candidates for P(S)Cell scheduling on the P(S)Cell and on the sSCell is and , respectively
   * s1=0.5; s2=0.5 based on RRC configuration – [15]
   * Additional (s1,s2) values can be considered, where s1>1 – [11]
   * For Type A UE, allow – [3]
5. Apply Rel-15/16 BD/CCE limit for a slot where CORESET(s) are assigned on only one of P(S)Cell and sSCell – [15]

### 2.1.2 DCI size matching

1. Approaches for DCI size matching
   * If a DCI format on the P(S)Cell for self-scheduling the P(S)Cell includes X bits and the corresponding DCI format on the sSCell for cross-carrier scheduling the P(S)Cell includes Y bits, |X-Y| bits are padded to the DCI format with the smaller size
     + [2],[4?],[7],[8],[9],[11],[13],
   * For a given non-fallback DCI format, the DCI fields and field sizes used for P(S)Cell self-scheduling are used also for sSCell to P(S)Cell cross-carrier scheduling
     + [3],[4?],[6]

### 2.1.3 Search space configuration

1. SS set on P(S)Cell configured with same *searchSpaceId* as another SS set on sSCell
   * If ‘light configuration’ (i.e., including only *searchSpaceId* and *nrofCandidates*) is not provided for the SS set, the SS is used for P(S)Cell self-scheduling – [2],[6],[12]
   * Rel-16 procedure for search space linking is fully re-used for DSS – [9]
     + It is up to the gNB to ensure that linked search space sets for DSS are suitably configured according to Rel-16 linkage framework, such as to ensure that a search space set for self-scheduling on the P(S)Cell has a different *searchSpaceId* from any “linked” search space set on the sSCell for CCS the P(S)Cell, or to ensure that “linked” search space sets on the P(S)Cell for CCS scheduling from sSCell do not include any parameters except for *searchSpaceId* and *nrofCandidates*
2. Cross-carrier scheduling configuration can be configured per USS set for P(S)Cell – [7]
   * For a linkage USS set which is monitored on sSCell (for scheduling P(S)Cell), monitoringSlotPeriodicityAndOffset, duration, monitoringSymbolsWithinSlot can also be configured on the corresponding USS set which will be monitored on P(S)Cell when sSCell is deactivated/dormant
3. Separate config of UL and DL DCI formats – [13]
4. Scheduling cell to be monitored for a USS set scheduling P(S)Cell is configured per each USS set index – [15]

### 2.1.4 sSCell deactivation/dormancy

1. Additional PDCCH BD/CCE candidates when sScell is deactivated/dormant
   * do not apply scaling factor or set – [3],[5],[6],[10],[11]
   * UE falls-back to operating with the Rel-16, single-scheduling cell, PDCCH monitoring limits for the P(S)Cell – [9]
   * No additional spec impact needed – [4]
2. Additional USS sets on P(S)Cell when sSCell is deactivated/dormant
   * For Type A, if UE monitors DCI 0\_1/1\_1/0\_2/1\_2 only on sSCell then additional USS sets for DCI formats DCI 0\_1/1\_1/0\_2/1\_2 are activated/available – [1],[3]
   * Fallback USS is monitored on P(S)Cell; ‘restore Rel16 monitoring on P(S)Cell – [2]
   * Support mechanism for monitoring non-fallback DCI formats on P(S)Cell – [5],[7],[15]
   * Monitor a fallback search space on P(S)Cell using SSSG mechanism – [6?], [14] (same mechanism also when ‘sSCell RLF’)
   * No additional spec impact needed – [4]
3. Timeline for additional PDCCH BD/CCE candidates and/or additional USS sets on P(S)Cell when sSCell is deactivated/dormant
   * ‘UE follows existing timeline’ – [9]
   * Check with RAN4 – [10]
   * Timing based on existing delays and margin for SSSG switching delay () -- [11]
4. SCell dormancy indication
   * Support DCI 0\_1/1\_1 based SCell dormancy indication also on sSCell – [6],[13]

### 2.1.5 General

1. Type A UE supports USS sets for DCI formats 0\_1,1\_1,0\_2,1\_2 on PCell – [3],[15]
2. Only 15kHz SCS supported for P(S)Cell when CCS used from sSCell to P(S)Cell – [8]
3. 1D1U unicast DCI for FDD P(S)Cell and 1D2U unicast DCI for TDD PCell/PSCell per SCS=15K slot – [10]
4. *enableDefaultBeamForCCS* can be configured in crossCarrierSchedulingConfig in the P(S)Cell, which configures default beam determination for a PDSCH on the P(S)Cell scheduled by a PDCCH on the sSCell – [12]

### 2.1.6 Spec clarification TPs

1. 38.214: TPs proposing to clarify the definition of ‘symbol i’ in out-of-order scheduling handling when P(S)Cell and sSCell have different SCS – [6],[12]
2. 38.213: TP proposing to clarify n\_CI for P(S)Cell when CCS from sSCell to P(S)Cell is configured – [2]
3. 38.213: TP proposing to clarify overbooking handling – [11]
4. 38.213: TP proposing to capture BD/CCE limits to result as integer values – [13]

Below are some proposals for discussion

## 2.2 Proposals

### Proposal 1

* (RRC parameter *PCell-CCSscaling* in RAN1 specs) is configured from below value set
  + {1/7, 3/14, 2/7, 3/7, 1/2, 5/7, reserved1, reserved2}

Companies are requested to indicate their view on the above proposal in the Table below

|  |  |
| --- | --- |
| **Company Name** | **Comments (Proposal 1)** |
| Moderator notes | Based on company inputs summarized in section 2.1.1, point 1. |
| Samsung | Generally OK in view of majority preference. Can further discuss necessity of 3/14, or including additional values such as 4/7. |
| Xiaomi | We are not sure why two reserved values are needed as it neither reduce RRC signaling overhead nor introduce any flexibility. On the other hand, we prefer to exploit the agreed eight values as much as possible. Hence, we prefer the value set from Ericsson, i.e. [2/14, 3/14, 4/14, 5/14, 6/14, 8/14, 10/14, 12/14]. |
| ZTE | We are ok with the first 6 candidate values.  In addition to that, we think “1” can also be added as the candidate value, in which case sSCell scheduling PCell is disabled. |
| Qualcomm | We are OK with the proposal. We do not think all the values have to be filled in (some can be reserved). Moreover, we do not think the value(s) of  >> 0.5 makes sense. Current FL proposal covers all the necessary configurations well. |
| Intel | We are fine with the 6 values.  We share same view as ZTE that value 1 can be added in the list. We observe an almost common view to support fallback to PCell self-scheduling when sSCell is deactivated or dormant. Allowing value 1 is the simple way to make whole procedure. |
| Huawei, HiSilicon | Support.  [2/14, 3/14, 4/14, 5/14, 6/14, 8/14, 10/14, 12/14] is also OK. There is no need to reserve it as new RRC (values) are always possible. |
| MTK | We are fine with the 6 values. Also fine with 8 values from Ericsson, i.e. [2/14, 3/14, 4/14, 5/14, 6/14, 8/14, 10/14, 12/14]. We slightly prefer not to include “1” as candidate value since changing α requires a RRC reconfiguration, and it seems not faster compared to disabling SCell scheduling PCell directly by RRC. |
| Spreadtrum | We are fine with the 6 candidate values. |
| CMCC | We are fine with the proposal. |
| vivo | We are fine with moderator proposal |
| Apple | We are fine with the proposal |
| Nokia, NSB | We are OK with the 6 values proposed, but would prefer going all the way and using all 8 codepoints as proposed by Ericsson |

### Proposal 2

* If a DCI format on the P(S)Cell for self-scheduling the P(S)Cell includes X bits and the corresponding DCI format on the sSCell for cross-carrier scheduling the P(S)Cell includes Y bits, |X-Y| bits are padded to the DCI format with the smaller size

Companies are requested to indicate their view on the above proposal in the Table below

|  |  |
| --- | --- |
| **Company Name** | **Comments (Proposal 2)** |
| Moderator notes | Based on company inputs summarized in section 2.1.2 |
| Samsung | Support |
| Xiaomi | Support. |
| ZTE | In previous RAN1 meeting, we have agreed that the number of CIF field is the same for PCell self-scheduling and sScell scheduling PCell. We would suggest to keep the same principle for all other fields, i.e., copying all the DCI fields of PCell self-scheduling to sSCell-scheduling-PCell. |
| Qualcomm | The proposal looks like we are expecting different PDCCH configurations for different scheduling cells that result in different DCI format sizes in different scheduling cells for the scheduled cell. We think it would be good to check if such case really exists.  *Tci-PresentInDCI* is configurable per CORESET from RRC point of view, but this is even for the self-scheduling. In Rel-15, it was discussed whether to address the possible misalignment of present/absent of *tci-PresentInDCI* between CORESETs. The common understanding at that time was that *tci-PresentInDCI* shall be present/absent on all the CORESETs in the cell. The same should be applied to the cross-carrier scheduling from sSCell to P(S)Cell.  Another case is SCell dormancy indication field. The current spec states that the field is present only when the DCI format is carried by PDCCH on the primary cell. However, this can be handled by simple change “when the DCI format is carried by PDCCH for~~on~~ the primary cell”. |
| Intel | We prefer to exactly align field size of each field in the DCI format. In fact, since DCI format 0\_1/1\_1 are also supported in PCell, the field size in DCI format 0\_1/1\_1 on PCell are already available. It would be quite simple to follow filed size on PCell to construct the DCI format on sSCell. |
| LG Electronics | Support |
| Huawei, HiSilicon | Support. |
| MTK | Support |
| Spreadtrum | We are fine to support the proposal.  If with this proposal, do we still need the agreement made in last meeting to align the number of CIF field for PCell self-scheduling and sScell scheduling PCell, hope get some clarification |
| CMCC | Support. This method can achieve total DCI size alignment between DCI format on the P(S)Cell for self-scheduling and DCI format on the sSCell for CCS in a simplified way, and it allows more flexibility. |
| Vivo | Support |
| Apple | Do we need to discuss it together with the following WA?  ***Working Assumption***   * *When CIF for sSCell to Pcell cross-carrier scheduling is configured,* *non-fallback DCI formats on P(S)Cell include same number of CIF bits as the corresponding non-fallback DCI formats on sSCell that are used for sSCell to P(S)Cell scheduling* * Note: per RAN1#102-e agreement, when sSCell to P(S)Cell scheduling is configured for the UE, cross-carrier scheduling from P(S)Cell to another cell is not allowed. The CIF bits included in non-fallback DCI formats on P(S)Cell are considered reserved. |
| Nokia, NSB | Support |

### Discussion Point 3

* Companies are requested to provide their view on below alternatives for SS set linking for CCS from sSCell to P(S)Cell
  + Alt1
    - For a SS set on P(S)Cell configured with same *searchSpaceId* as another SS set on sSCell, if parameters other than *searchSpaceId* and *nrofCandidates* are configured for the SS set, the SS set is used for P(S)Cell self-scheduling
  + Alt2
    - For a SS set on P(S)Cell configured with same *searchSpaceId* as another SS set on sSCell, parameters other than *searchSpaceId* and *nrofCandidates* are not configured for the SS set, and the SS set is not used for P(S)Cell self-scheduling

Companies are requested to indicate their view on the above alternatives in the Table below

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| --- | --- |
| **Company Name** | **Comments (Discussion Point 3)** |
| Moderator notes | Based on company inputs summarized in point 1 of section 2.1.3. Was also raised in RAN2 as part of RRC CR discussion. |
| Samsung | Prefer Alt-2 in order to fully re-use existing Rel-16 spec for search space linking. However, fine to go with the majority view. |
| Xiaomi | Alt-2. |
| ZTE | It would be good if we can confirm that the legacy SS linking rule is applied. Then in this case, it seems all the Alt.1 and Alt.2 are valid. |
| Qualcomm | It seems capturing/combining both (Alt1 and Alt2) would be clearer. |
| Intel | We prefer Alt 1 to reuse the legacy principle for SS set linking. That is, it is cross-carrier scheduling if only *searchSpaceId* and *nrofCandidates* are configured for a SS set |
| LG Electronics | As suggested by our Tdoc, our preference is to configure the scheduling cell per each USS set index.  As for two alternatives, further clarifications (i.e., whether the following understanding is correct or not) seem to be required.   * For Alt 1, from our understanding, if a SS set on P(S)Cell is configured with same *searchSpaceId* as another SS set on sSCell, then the SS set is used for cross-carrier scheduling from sSCell. Otherwise, if the index of a SS set configured on P(S)Cell does not exist for another SS set configured on sSCell, then the SS set is used for P(S)Cell self-scheduling. * For Alt 2, even though Alt 2 is adopted, we think the current specification should be modified. |
| Huawei, HiSilicon | Alt-2. |
| MTK | Prefer Alt-2 in order to fully re-use existing Rel-16 spec for search space linking. However, fine to go with the majority view. |
| Spreadtrum | We prefer Alt-2. In addition, we propose to update it as:  For a SS set on P(S)Cell configured with same searchSpaceId as another SS set on sSCell, parameters other than searchSpaceId and nrofCandidates are not configured for the SS set, and the SS set is not used for P(S)Cell self-scheduling. Otherwise, the SS set is used for P(S)Cell self-scheduling. |
| CMCC | We prefer Alt 1. This configuration especially benefits to the case when sSCell is deactivated or dormant. If additional USS sets monitored on P(S)Cell is supported when CCS on sSCell is disabled, the linkage USS set configured with complete parameters on P(S)Cell can be directly monitored, which provides more scheduling opportunities as all SS sets configured on P(S)Cell can be monitored when CCS is disabled. |
| vivo | We prefer Alt. 1 if our understanding is correct as described below.  For Alt. 1, a search space in P(S)cell with light configuration (including only *searchSpaceId* and *nrofCandidates*) and a search space in sScell with full configuration with the same *searchSpaceId* are linked to each other in case of sScell scheduling P(S)cell. In another word, the SS for Pcell self-scheduling and for sScell self-scheduling could have the same *searchSpaceId*. One example is shown below for Alt. 1.    For Alt. 2, UE is not expected to be provided a search space in P(S)cell with a full configuration that has the same ID as a search space in sScell with the full configuration. One example is provided below:    It is clearly observed that Alt. 2 consumes two more additional search space IDs to achieve the same function. Therefore, Alt. 1 is a better choice. |
| Apple | Alt 2 |
| Nokia, NSB | For Rel-16 commonality, we prefer Alt2, but would not object to Alt1. |

### Proposal 4 (Conclusion?)

* For a UE configured with cross-carrier scheduling from a SCell to Pcell/PSCell, *enableDefaultBeamForCCS* can be configured in *rossCarrierSchedulingConfig* in the Pcell/PSCell, which configures default beam determination for a PDSCH on the Pcell/PSCell scheduled by a PDCCH on the sSCell

Companies are requested to indicate their view on the above Proposal in the Table below

|  |  |
| --- | --- |
| **Company Name** | **Comments (Proposal 4)** |
| Moderator notes | Based on company input captured in point 4 of section 2.1.5. Was also raised in RAN2 as part of RRC CR discussion. |
| Samsung | OK to extend Rel-16 spec to the case of Pcell cross-carrier scheduling for DSS |
| Xiaomi | We are fine to take it as a conclusion. |
| ZTE | OK to make it as a conclusion. |
| Qualcomm | We are OK with the proposal. |
| Intel | OK to make it as a conclusion. |
| LG Electronics | OK |
| Huawei, HiSilicon | Ok |
| MTK | Ok |
| Spreadtrum | We are fine for it. |
| CMCC | We are fine with the conclusion. |
| Vivo | OK |
| Apple | We are fine with the proposal |
| Nokia, NSB | OK, and should by default apply as the Rel-16 definition has no relation to PCell and SCell, just scheduling cell and scheduled cell. |

### Discussion Point 5

* Companies are requested to provide their view on below alternatives for BD/CCE handling of Type A UE and Type B UE
  + Alt 1: Only (s1=1, s2=0) are used and additional values are not supported
  + Alt2: Values other than (s1=1, s2=0) can be used. Additional values for (s1, s2) are configured via RRC
    - Alt 2-1
      * s1=; s2=1-
    - Alt 2-2
      * s1=1; s2=1
    - Alt 2-3
      * s1=0.5; s2=0.5
    - Alt 2-4
      * Additional scaling factor configured via RRC
        + when is configured, maximum number of PDCCH candidates for P(S)Cell scheduling on the P(S)Cell and on the sSCell as and , respectively
        + otherwise, maximum number of PDCCH candidates for P(S)Cell scheduling on the P(S)Cell and on the sSCell is and , respectively

Companies are requested to indicate their view on the above alternatives in the Table below

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| --- | --- |
| **Company Name** | **Comments (Discussion Point 5)** |
| Moderator notes | Based on company inputs summarized in point 4 of section 2.1.1. Note – this issue was also discussed in RAN1#107-e (Discussion point 4 in [16]). |
| Samsung | This is an open issue from the agreement in RAN1#107-e “*If no additional set of (s1, s2) is introduced…*” Alt-2-2 is preferred as it enables PDCCH actual offloading from PCell to sSCell by decreasing PDCCH candidates on PCell and increasing them on the sSCell. That is expected from DSS but is not supported by Alt-1. Alt-2-2 also preserves the total number of PDCCH candidates – so, it is preferred over Alt-2-1 and Alt-2-3.  Alt-2-4 is not about selection of (s1,s2) values, but enables more flexible PDCCH allocation between PCell and sSCell based on the SCS of both PCell and sSCell, (instead of on SCS of only the PCell which can be still used as fall-back). That can also be more forward-compatible and allow extensions (e.g. to span-based monitoring). |
| Xiaomi | We prefer alt 1. (S1,S2)-combination actually determines the upper limit of the BD/CCE across serving cells within a cell group. Flexibility of SS configuration can be still achieved with s1=1 and s2=0.  On the other hand, there are many options on table if we open the door for the other (S1,S2)-combinations. We are afraid that it is hard to find a way out with so many divergent views at such a late stage. |
| ZTE | At this late stage, we would suggest to go with Alt.1. Alt.2 may increase some flexibility somehow but it needs extensive discussion and much spec change. |
| Qualcomm | Our understanding is that we have concluded to specify (s1=1, s2=0) after long discussion, which usually means we do not work on the other cases (or de-prioritize the others). |
| Intel | We prefer Alt 2-1. Alt 2-3 sounds a special case of Alt 2-1. Alt 2-2 can be considered too.  We already discussed this issue for several meeting. Supporting Alt 1 only results in limited scheduling flexibility for P(S)Cell. The limitation especially comes from CCE budget. Since PDCCH is separately in P(S)Cell and sSCell, it is not possible to share CCE budget. All Alt 2-1/2/3 has the merit for better scheduling flexibility. |
| LG Electronics | In order to provide well-balanced PDCCH monitoring occasions between Pcell and sScell, we support Alt 2. Our preference among alternatives of Alt 2 is Alt 2-1 or Alt 2-3. |
| Huawei, HiSilicon | We support Alt2 to introduce the additional values for (s1, s2) that are configured via RRC. S2=0 is unsuitable for some UE implementations.  All three alternatives Alt 2-1, Alt 2-2 and Alt 2-3 can increase scheduling flexibility. We can consider accept one or more of these alternatives. |
| MTK | We share similar view as ZTE and prefer Alt. 1, but open to take majority views. |
| Spreadtrum | Same views as ZTE and Qualcomm. We support Alt.1. |
| CMCC | We support Alt 1. We think there is no need to introduce other values besides s1=1 and s2=0. Considering Alt 2-1, Alt2-2 and Alt 2-3, these scaling factor combinations may cause unnecessary restriction to PDCCH monitoring on P(S)Cell for self-scheduling and sSCell for CCS due to the total budget decrease. Besides, since “ UE is not required to monitor more than PDCCH BD candidates per sSCell slot on sSCell” has been agreed, which means that the BD budget distributed on sSCell for CCS is only counted in , and not counted in , this is consistent with the interpretation of value s1=1 and s2=0. |
| Vivo | We support Alt. 1 at this stage |
| Apple | Alt 1 |
| Nokia, NSB | We are fine with sticking to Alt1. We could consider Alt 2-2 or 2-3 as those are completely defined and don’t lave any scaling questions open, and are simple, but don’t see the practical need. |

### Proposal 6-1

* Scaling factor (RRC parameter *PCell-CCSscaling* in RAN1 specs) is enabled/disabled for PDCCH monitoring on P(S)Cell in response to triggering of sSCell activation/deactivation
  + The scaling factor is enabled/disabled no later than the minimum requirement defined in TS 38.133 (clause 8.3.2) and no earlier than P(S)cell slot n+ k, where
    - for sSCell activation/de-activation,
    - slot n+m is a slot indicated for PUCCH transmission with HARQ-ACK information for the PDSCH reception containing sSCell activation/deactivation MAC-CE
    - is currently specified SSSG switching delay
* Scaling factor (RRC parameter *Pcell-CCSscaling* in RAN1 specs) is enabled/disabled for PDCCH monitoring on P(S)Cell in response to triggering of sSCell BWP switch to non-dormant BWP/dormant BWP
  + The scaling factor is enabled/disabled after a time duration of from the slot the BWP switch is triggered for sSCell transition to/from dormancy, where
    - , with , and being SCS of P(S)Cell and sSCell, respectively

Companies are requested to indicate their view on the above Proposal in the Table below

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| --- | --- |
| **Company Name** | **Comments (Proposal 6-1)** |
| Moderator notes | Based on company inputs summarized in points 1,3 of section 2.1.4. Intention is to discuss a ‘complete proposal’ based on the provided inputs. Note – this issue was also discussed in RAN1#107-e (Discussion point 9 in [16]). |
| Samsung | We support disabling DSS operation based on sSCell deactivation/dormancy.  But there is no need for any new timeline compared to Rel-16, and those in TS 38.213 and TS 38.133 for sSCell activation/deactivation and sSCell dormancy can hold. The spec can simply say along the lines of “When the Scell is an activated serving cell…”. |
| Xiaomi | Two clarification questions:  Clarfication#1: What is the impact from enabling/disabling? Alpha is used as a scaling factor on the BD/CCE assignment between Pcell/PSCell and sSCell. In the other words, it only define the cap of BD/CCE on Pcell/PSCell and sSCell respectively. No matter it is enabled or disabled, the search space configuration is not changed on the Pcell/PSCell. Hence, what is the meaning of introduce dynamic alpha enabling/disabling?  Clarfication#2: Regarding to the timeline component , we are not sure whether it is sufficient to directly reuse the search space group switching gap for enabling/disabling. For search space group switching, search space groups are pre-configured and UE only need to execute search space switching. But for enabling/disabling, both UE and gNB need to re-calculate the BD/CCE cap for Pcell/PSCell and sSCell respectively. We would like to hear more views from companies. |
| ZTE | We support the proposal in general.  However, we don’t see the motivation to include “” in the timelines above. Based on our understanding, the legacy timeline is sufficient. |
| Qualcomm | On sSCell activation/deactivation   * Propose to clarify that the support of this proposal is based on additional optional UE capability (i.e., not part of FG34-1 or FG34-2).   + Details can be discussed in UE feature session, but at least this high-level agreement should be made as part of the proposal. * Propose to decouple sSCell activation and sSCell deactivation.   + For sSCell deactivation, the proposed timeline is fine for us.   + For sSCell activation, RAN4 does not have a particular requirement on when the UE has to start PDCCH monitoring on the to-be-activated sSCell (other than the latest timing that is the minimum requirement for Scell activation delay specified in TS 38.133). We consider that this proposal should not change this principle. Therefore, we prefer not to align the timelines of sSCell activation/deactivation; in case of sSCell activation, the UE applies scaling factor  no later than symbols after the UE completes the sSCell activation anytime.   On sSCell dormant/non-dormant BWP   * Same as for sSCell activation/deactivation, we propose to have a bullet that this is based on additional optional UE capability (i.e., not part of FG34-1 or FG34-2). * We wonder why has to be defined as above? Clarification would be helpful. |
| Intel | We support enabling/disabling and are OK to define a timeline for enabling/disabling. Preferably reusing an existing timeline.   * For sSCell (de)activation, , if agreed, is more than 3ms which is large enough. So additional time may not be necessary * For sSCell dormancy, the dormancy switching delay is enough to start/stop all control/data operation on a Cell. Therefore, additional time may not be necessary   On the other hand, if RAN1 cannot conclude a value. Sending LS to RAN4 can be considered. RAN1 can make an agreement on other parts except the delay value of timeline |
| LG Electronics | In general we support the main bullets, but we may need further discussion on whether any modification is required to the timing requirement for activation/deactivation or dormant BWP switching. |
| Huawei, HiSilicon | We have similar question as QC on |
| MTK | We think the timeline should be determined by RAN4. RAN1 only has to decide whether to support the α scaling enabling/disabling for sSCell activation/deactivation and sSCell BWP switch to non-dormant BWP/dormant BWP. |
| CMCC | We are fine with the proposed timeline. |
| Vivo | We support the direction of proposal. Timeline issues could be determined by RAN4 |
| Apple | We do not think the sSCell activation/deactivation and dormancy and activation/deactivation of \alpha is really that important especially considering the intention of this WI is for DSS  We need to make this feature UE optional and the timeline may need further discussion |
| Nokia, NSB | OK in general, but alone this is insufficient as it just scales the BDs, but we’d still need to reconfigure the BDs for the rescaling to help. Is an integral part of some solution that also adapts the SS when the sSCell is deactivated/made dormant. |

### Proposal 6-2

* At least for Type A UE, additional SS sets are configured for P(S)Cell such that they are monitored on P(S)Cell when sSCell is deactivated and they are not monitored on P(S)Cell when sSCell is activated
  + The monitoring of SS sets enabled/disabled no later than the minimum requirement defined in TS 38.133 (clause 8.3.2) and no earlier than P(S)cell slot n+ k, where
    - for sSCell activation/de-activation,
    - slot n+m is a slot indicated for PUCCH transmission with HARQ-ACK information for the PDSCH reception containing sSCell activation/deactivation MAC-CE
    - is currently specified SSSG switching delay
* At least for Type A UE, additional SS sets are configured for P(S)Cell such that they are monitored on P(S)Cell when sSCell is switched to dormant BWP and they are not monitored on P(S)Cell when sSCell is switched to non-dormant BWP
  + The monitoring of SS sets is enabled/disabled after a time duration of from the slot the BWP switch is triggered for sSCell transition to/from dormancy, where
    - , with , and being SCS of P(S)Cell and sSCell, respectively

Companies are requested to indicate their view on the above Proposal in the Table below

|  |  |
| --- | --- |
| **Company Name** | **Comments (Proposal 6-2)** |
| Moderator notes | Based on company inputs summarized in points 2,3 of section 2.1.4. Intention is to discuss a ‘complete proposal’ based on the provided inputs. Note – this issue was also discussed in RAN1#107-e (Discussion point 9 in [16]). |
| Samsung | Not needed.  gNB configuration can handle such scenarios, including usage of search space set overbooking/dropping, and search space set group (SSSG) switching. |
| Xiaomi | It is a parallel solution with that under proposal 6-1, does this mean we need to specify both of them?  Similar clarification question as proposal 6-1. In this proposal, is still applicable to the BD/CCE limit on the Pcell/PSCell, I am not sure whether the additional search space on Pcell/PSCell make any sense. |
| ZTE | We are open to consider the above proposal.  The above proposal may be useful if type-A UE is not allowed to receive non-fallback DCI on Pcell.  Similarly, if the proposal is to be adopted, the “” should be removed. |
| Qualcomm | We think “enabling/disabling the scaling factor ” and “enabling/disabling additional SS set(s) monitoring on P(S)Cell” are different and hence require separate UE capabilities. We propose to include a bullet for separate UE capability in the proposal 6-2.  In addition to the capability ignaling, proposal 6-2 would require to specify the RRC parameters for enabling/disabling particular SS set(s) on the P(S)Cell.  Regarding the details of the proposal, we have the same comments as for proposal 6-1 (copied below).  On sSCell activation/deactivation   * Propose to clarify that the support of this proposal is based on additional optional UE capability (i.e., not part of FG34-1 or FG34-2).   + Details can be discussed in UE feature session, but at least this high-level agreement should be made as part of the proposal. * Propose to decouple sSCell activation and sSCell deactivation.   + For sSCell deactivation, the proposed timeline is fine for us.   + For sSCell activation, RAN4 does not have a particular requirement on when the UE has to start PDCCH monitoring on the to-be-activated sSCell (other than the latest timing that is the minimum requirement for Scell activation delay specified in TS 38.133). We consider that this proposal should not change this principle. Therefore, we prefer not to align the timelines of sSCell activation/deactivation; in case of sSCell activation, the UE disables additional SS set(s) no later than symbols after the UE completes the sSCell activation anytime.   On sSCell dormant/non-dormant BWP   * Same as for sSCell activation/deactivation, we propose to have a bullet that this is based on additional optional UE capability (i.e., not part of FG34-1 or FG34-2). * We wonder why has to be defined as above? Clarification would be helpful. |
| Intel | We support the switching of SS sets and fine to define related to timeline. Reusing existing timeline is preferred. If RAN1 cannot conclude a value. Sending LS to RAN4 can be considered. RAN1 can make an agreement on other parts except the delay value of timeline |
| LG Electronics | In general we support the main bullets, but we may need further discussion on whether any modification is required to the timing requirement for activation/deactivation or dormant BWP switching. |
| MTK | We tend to share similar view with Samsung. If RAN1 decides to support this additional SS set configuration, we support Intel’s view to leave the delay value of timeline to RAN4 |
| CMCC | We are fine with the proposal. Since that the additional SS sets pre-configured on P(S)Cell can only be monitored on P(S)Cell when sSCell is deactivated/dormant and not monitored when CCS is enabled, the SSSG switching delay needs to be considered. |
| Vivo | We support the proposal and timeline issue could be left to RAN4. We think there is no need to limit this proposal to Type A Ues and could also be applicable to Type B Ues. |
| Apple | We do not need both 6-1 and 6-2, to be honest |
| Nokia, NSB | We support the proposal. As said in 6-1, the BD limit scaling alone is useless if there is no mechanism to adapt the SS configuration of the PCell when the sSCell goes inactive/dormant.  This capability should not be tied to type A and Type B, even though it is even more necessary for Type A UEs. |

### Discussion Point 7

* Companies are requested to provide their view on below alternatives for handling SCell dormancy indication when UE is configured for CCS from sSCell to P(S)Cell
  + Alt1
    - No change from Rel16. Scell dormancy indication is sent only on P(S)Cell
  + Alt2
    - Scell dormancy indication (Case 1 and Case 2) is supported when DCI format 0\_1 or 1\_1 is carried by PDCCH for the primary cell on either sSCell or P(S)Cell

Companies are requested to indicate their view on the above alternatives in the Table below

|  |  |
| --- | --- |
| **Company Name** | **Comments (Discussion Point 7)** |
| Moderator notes | Based on company inputs summarized in point 4 of section 2.1.4. |
| Samsung | Support Alt. 1 – DSS does not need to introduce new operating conditions for indicating Scell dormancy to justify the requirement for new specification support. |
| Xiaomi | Alt 1 is sufficient. |
| ZTE | Support Alt.2  If Type-A is not allowed to receive non-fallback DCI, then basically Alt.1 means type-A UE is not allowed to indicate Scell dormancy via DCI format 0\_1/1\_1. Thus, Alt.2 is preferred. |
| Qualcomm | Alt1. |
| Intel | We prefer Alt 2 to allow DCI for Scell dormancy indication on both P(S)Cell and sSCell. As commented by ZTE, all/most unicast DCI on sSCell is one of the typical case of DSS, which requires DCI for Scell dormancy indication on sSCell, otherwise, the function cannot run smoothly. |
| LG Electronics | Alt 1 |
| Huawei, HiSilicon | We share the same view as ZTE. |
| MTK | We share similar view with ZTE and slightly prefer Alt. 2. |
| Spreadtrum | Alt1. |
| CMCC | We prefer Alt 1. |
| vivo | No strong view and we are open to discuss Alt. 2 |
| Apple | Alt 1 |
| Nokia, NSB | Alt2 would be nice to have. If Alt2 can’t be agreed, Alt1 would seem to be the default “do nothing” outcome. |

### Proposal 8 (Conclusion)

* When CCS from sSCell to P(S)Cell is configured, the configuration of Type 3 CSS set for DCI format 2\_5 and applicability of the information in the DCI format is same as in Rel-16

Companies are requested to indicate their view on the above proposal in the Table below

|  |  |
| --- | --- |
| **Company Name** | **Comments (Proposal 8)** |
| Moderator notes | Based on company inputs summarized in section 2.1.1, point 3. |
| Samsung | OK |
| Xiaomi | Support. |
| ZTE | OK |
| Qualcomm | OK |
| Intel | OK |
| LG Electronics | Support |
| Huawei, HiSilicon | Ok |
| MTK | Ok |
| Spreadtrum | Ok |
| CMCC | Support |
| vivo | OK |
| Apple | We are fine with the proposal |
| Nokia, NSB | OK |

### Discussion Point TP-1

* For 38.214 sub clause 5.1 and 6.1, is it OK to further clarify the term “symbol i” for case of different SCS between P(S)Cell and sSCell?
  + If yes, which TP is preferred? TP1 in Proposal 7 of [R1-2201720](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_108-e/Docs/R1-2201720.zip) or TP in Proposal 4 of [R1-2202163](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_108-e/Docs/R1-2202163.zip)

Companies are requested to indicate their view on the above proposal in the Table below

|  |  |
| --- | --- |
| **Company Name** | **Comments (Discussion Point TP-1)** |
| Moderator notes | Based on company inputs summarized in section 2.1.6, point 1. |
| Samsung | OK with the “TP in Proposal 4 of x2163” |
| Xiaomi | From our understanding, the current wording in the specification automatically means the symbol j is defined from scheduling cell perspective. If majority view agrees such clarification, we prefer TP1 in Proposal 7 of R1-2201720. |
| ZTE | We are fine with the intention of this TP. We can even remove the description of “i” and “j” in the spec if necessary to avoid the potential confusion. |
| Qualcomm | We are open to any TP as long as it is clear that OOO for a given scheduled cell is not allowed even between two scheduling cells.  Considering that the scheduled cell is the common ground (unlike first scheduling cell which could be changed dynamically), we slightly prefer Proposal 4 of R1-2202163. |
| Intel | We support TP1 in Proposal 7 of [R1-2201720](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_108-e/Docs/R1-2201720.zip) as proponent. Proposal 4 of [R1-2202163](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_108-e/Docs/R1-2202163.zip) may have a problem. If we refer scheduled cell to define symbol I, there is no OOO for the following figure, since PDCCH 1 is ending in symbol I, and PDCCH 2 ends in symbol I too. However, this figure is obvious OOO. Such problem can be avoided if referring scheduling cell to define symbol i. |
| LG Electronics | In our view, TP1 in Proposal 7 of R1-2201720 is preferred. Furthermore, TP1 in Proposal 7 of R1-2201720 can be refined as below:   |  | | --- | | **------------------------------   TP#1: TS 38.214 -----------------------------------**  \*\*\* Unchanged text is omitted \*\*\* **5.1      UE procedure for receiving the physical downlink shared channel** \*\*\* Unchanged text is omitted \*\*\*  For any two HARQ process IDs in a given scheduled cell, if the UE is scheduled to start receiving a first PDSCH starting in symbol *j* by a PDCCH ending in symbol *I* on a ~~first~~ scheduling cell, the UE is not expected to be scheduled to receive a PDSCH starting earlier than the end of the first PDSCH with a PDCCH that ends later than symbol *I* of the ~~first~~ scheduling cell.  \*\*\* Unchanged text is omitted \*\*\* **6.1      UE procedure for transmitting the physical uplink shared channel** \*\*\* Unchanged text is omitted \*\*\*  For any two HARQ process IDs in a given scheduled cell, if the UE is scheduled to start a first PUSCH transmission starting in symbol *j* by a PDCCH ending in symbol *I* on a ~~first~~ scheduling cell, the UE is not expected to be scheduled to transmit a PUSCH starting earlier than the end of the first PUSCH by a PDCCH that ends later than symbol *I* of the ~~first~~ scheduling cell. | |
| Huawei, HiSilicon | We prefer TP1 in Proposal 7 of R1-2201720 as explained by Intel. |
| MTK | We slightly prefer TP1 in Proposal 7 of R1-2201720 |
| CMCC | Since there may be more than one scheduling cells, we think it is more intuitive to clarify the the term “symbol i” from the perspective of scheduled cell. And we prefer TP in Proposal 4 of [R1-2202163](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_108-e/Docs/R1-2202163.zip). |
| Vivo | We share the same view with xiaomi that it implies scheduling cell in current spec. If majority support to have a TP, we prefer TP1 in Proposal 7 of R1-2201720. |
| Nokia, NSB | We’d be OK to clarify the issue in the spec. |

### Discussion Point TP-2

* For 38.213 sub clause 10.1, is it OK to further clarify the term for case of SCS between P(S)Cell and sSCell as proposed in TP#2 in Proposal 6 of [R1-2201118](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_108-e/Docs/R1-2201118.zip)

Companies are requested to indicate their view on the above proposal in the Table below

|  |  |
| --- | --- |
| **Company Name** | **Comments (Discussion Point TP-2)** |
| Moderator notes | Based on company inputs summarized in section 2.1.6, point 2. |
| Samsung | No need for the proposed TP – it is current operation for self-scheduling on the PCell and for cross-carrier scheduling from the sSCell. |
| Xiaomi | Similar views as Samsung. |
| ZTE | We can also wait for the RRC signaling design first and then check whether any spec change is needed for this part. |
| Qualcomm | We think the TP makes spec clearer. |
| Intel | We share similar view as Samsung and Xiaomi. We also fine to wait to see if any new details can be agreed on SS set configuration. |
| LG Electronics | We share the view with Samsung. |
| MTK | We share the view with ZTE |
| Spreadtrum | Same view as Samsung. |
| CMCC | No need for the TP-2. The interpretation of the term in current specification is also valid for cross-carrier scheduling under DSS scenario. |
| vivo | We support the TP as proponent.  We don’t think current spec is clear on this. For sScell scheduling Pcell case, Pcell will be configured with a carrier indicator field by *CrossCarrierSchedulingConfig*. If following current spec, the configured CIF will be used for Pcell self-scheduling. However, this is not correct, the configured CIF will be only used for sScell scheduling Pcell.   * is the carrier indicator field value if the UE is configured with a carrier indicator field by *CrossCarrierSchedulingConfig* for the serving cell on which PDCCH is monitored; otherwise, including for any CSS, ; |
| Nokia, NSB | We’d be OK with the TP, but as indicated by ZTE and MTek we could wait for the RRC design to mature. |

### Discussion Point TP-3

* For 38.213 sub clause 10.1, is it OK to further clarify overbookingfor case of SCS between P(S)Cell and sSCell as proposed in TP in Proposal 2 of [R1-2202052](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_108-e/Docs/R1-2202052.zip)

Companies are requested to indicate their view on the above proposal in the Table below

|  |  |
| --- | --- |
| **Company Name** | **Comments (Discussion Point TP-3)** |
| Moderator notes | Based on company inputs summarized in section 2.1.6, point 3. |
| Samsung | Not needed. Already captured in TS 38.213 |
| Xiaomi | We are fine with the TP. |
| Qualcomm | Agree with the intention of the proposal. We may need to work on the wording of the TP. |
| Intel | We share similar view as Samsung since similar information as the TP is captured in the end of section 10.1.1 |
| MTK | We prefer to have the TP. If this information is already captured in spec, we would be grateful if some company can copy the text here for a quick convergence. |
| Spreadtrum | We are fine with the TP. |
| CMCC | We are fine with the TP. |
| vivo | Agree with Samsung that it is already captured. |
| Nokia, NSB | Agree with Qualcomm that the intention is agreeable, but the TP itself is not fully ready. Especially the term Overbooking is actually not defined by the specifications, so saying that it is not supported does not yet say what is not supported. |

### Discussion Point TP-4

* For 38.213 sub clause 10.1.1, is it OK to capture BD/CCE limits for P(S)Cell self-scheduling and sSCell to P(S)Cell scheduling as proposed in Proposal 2 and TP of Annex A of [R1-2202221](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_108-e/Docs/R1-2202221.zip)

Companies are requested to indicate their view on the above proposal in the Table below

|  |  |
| --- | --- |
| **Company Name** | **Comments (Discussion Point TP-4)** |
| Moderator notes | Based on company inputs summarized in section 2.1.6, point 4. |
| Samsung | The text is OK as it. The use of integer numbers and the application of ‘floor’ is a default consequence for the number of PDCCH candidates or non-overlapping CCEs. |
| Xiaomi | We are fine with the TP. |
| Qualcomm | We are OK with the proposal. |
| Intel | We are fine with the TP. = , right? |
| Huawei, HiSilicon | Fine with the TP. |
| MTK | OK with the TP. |
| Spreadtrum | We are OK with the TP. |
| CMCC | We are fine with the TP. |
| vivo | We are fine with the TP |
| Nokia, NSB | OK with the TP |

### Discussion Point (General)

Please use table below to provide any general/additional comments

|  |  |
| --- | --- |
| **Company Name** | **General/additional Comments** |
|  |  |
|  |  |

# 3 Conclusions

TBD

# 4 References

1. R1-2200914 Discussion on PDCCH scheduling from Scell Huawei, HiSilicon
2. R1-2201118 Remaining issues on Scell scheduling Pcell vivo
3. R1-2201174 Maintenance of Cross-Carrier Scheduling from SCell to PCell ZTE
4. R1-2201298 Discussion on cross-carrier scheduling from SCell to PCell OPPO
5. R1-2201499 Remaining issues on cross-carrier scheduling enhancements for NR DSS NTT DOCOMO, INC.
6. R1-2201720 On SCell scheduling PCell transmissions Intel Corporation
7. R1-2201879 Remaining issues on cross-carrier scheduling from SCell to PCell CMCC
8. R1-2201935 Remaining issues on cross-carrier scheduling from SCell to PCell Xiaomi
9. R1-2202037 Remaining details of cross-carrier scheduling from SCell to PCell Samsung
10. R1-2202052 On Cross-Carrier Scheduling from sSCell to P(S)Cell MediaTek Inc.
11. R1-2202091 Cross-carrier scheduling (from Scell to Pcell) Lenovo
12. R1-2202163 Cross-carrier scheduling from an SCell to the PCell/PSCell Qualcomm Incorporated
13. R1-2202221 Maintenance of enhanced cross-carrier scheduling for DSS Ericsson
14. R1-2202270 Remining issues on sSCell to Pcell scheduling Nokia, Nokia Shanghai Bell
15. R1-2202353 Discussion on cross-carrier scheduling from SCell to Pcell LG Electronics
16. R1-2112884 Summary#5 of Email discussion [107-e-NR-DSS-01] Moderator (Ericsson)

# 5 Annex A – Agreements from previous meetings

## Agreements from RAN1#102-e

Agreements:

* Following scheduling combinations are allowed/not allowed when cross-carrier scheduling from an SCell to PCell/PSCell is configured  
  1. self-scheduling on PCell/PSCell is allowed
  2. cross-carrier scheduling from PCell/PSCell to another SCell is not allowed
  3. self-scheduling on the ‘SCell used for scheduling PCell/PSCell’ is allowed
  4. cross-carrier scheduling from the ‘SCell used for scheduling PCell/PSCell’ to another serving cell is allowed
  5. cross-carrier scheduling from another serving cell to the ‘SCell used for scheduling PCell/PSCell’ is not allowed
* FFS: Search space and DCI format handling for the allowed cases above

Agreements:

* Configuring 2 or more Scells to schedule the PCell/PSCell is not allowed

## Agreements from RAN1#103-e

**Conclusion**

* When CCS from sSCell to PCell/PSCell is configured, the configuration of Type 3 CSS set for DCI formats 2\_0, 2\_1, 2\_2, 2\_3, 2\_4 and applicability of the information in the DCI formats are the same as in Rel-15/Rel-16
  + FFS: DCI format 2\_5 and DCI Format 2\_6 handling
* Note: The SCell configured with CCS to Pcell/PSCell is referred to as ‘sSCell’

**Conclusion**

* When the PCell/PSCell and sSCell use different numerologies, the PDSCH reception preparation time between the PDCCH on the sSCell and the PDSCH on the PCell/PSCell is applied (i.e., as specified in TS38.214 Section 5.5).

Agreements:

* When CCS from an SCell (sSCell) to PCell/PSCell is configured, UE monitors Type 0/0A/1/2 CSS sets (for the DCI formats associated with those SS sets) only on the PCell/PSCell and not on the sSCell
  + Note: UE monitors Type 0/0A/2 CSS only on PCell while Type 1 CSS can be monitored on PCell/PSCell

Agreements:

* Discuss in RAN1#104-e how to handle ‘DCI formats 0\_1,1\_1,0\_2,1\_2 scheduling PDSCH/PUSCH on PCell/PSCell’ from USS set(s), when CCS from sSCell to PCell/PSCell is configured.. Below alternatives can be considered in the discussion (other alternatives are not precluded)
* ~~Below alternatives can be considered in the discussion (other alternatives are not precluded)~~
  + Alt 1: ~~When CCS from sSCell to PCell/PSCell is configured,~~ UE cannot be configured to monitor DCI formats 0\_1,1\_1,0\_2,1\_2 on PCell/PSCell USS set(s), and can be configured to monitor them only on the sSCell USS set(s)
  + Alt 2: ~~When CCS from sSCell to PCell/PSCell is configured,~~ UE can be configured to monitor DCI formats 0\_1/1\_1/0\_2/1\_2 on PCell/PSCell USS set(s), and/or on sSCell USS set(s). The PDCCH monitoring is based on following alternatives (other alternatives are not precluded)
    - Alt 2-1:
      * UE can monitor DCI formats 0\_1,1\_1,0\_2,1\_2 on both PCell USS set(s) and sSCell USS sets simultaneously
        + ~~FFS activation/deactivation of scheduling from sSCell to PCell/PSCell~~
    - Alt 2-2:
      * Dynamic switching of PDCCH monitoring of DCI formats 0\_1,1\_1,0\_2,1\_2 between monitoring on PCell/PSCell USS sets and monitoring on sSCell USS sets is supported
        + FFS: Details of switching mechanism (~~e.g. based on SS group switching, based on BWP switching,…~~)
      * UE does not monitor DCI formats 0\_1,1\_1,0\_2,1\_2 on both PCell USS set(s) and sSCell USS sets simultaneously
    - Alt 2-3:
      * UE does not monitor the same DCI format on both PCell USS set(s) and sSCell USS sets simultaneously. UE can monitor some DCI formats on sSCell USS sets and other DCI formats on PCell/PSCell USS sets simultaneously
    - Alt 2-4:
      * The USS set(s) on PSCell/PCell and the USS set(s) on sSCell are configured such that UE does not monitor DCI formats 0\_1,1\_1,0\_2,1\_2 on both PCell USS set(s) and sSCell USS set(s) simultaneously
* FFS following aspects
  + Impact of sSCell activation/deactivation and sSCell dormancy
  + Impact on BD/CCE limit handling ~~including considering PDCCH monitoring on CSS sets and PDCCH monitoring of ‘DCI formats 0\_0, 1\_0 scheduling PUSCH/PDSCH on PCell/PSCell’~~
  + Whether PDCCH overbooking on sSCell is supported or not supported and impact (if any) on overbooking handling on PCell/PSCell
  + Impact from different numerologies between PDCCH on the PCell/PSCell and that on the sSCell
  + Whether or not to have mechanism for activation/deactivation of scheduling from sSCell to PCell/PSCell
  + USS configuration details (e.g. handling of USS type (self-scheduling, cross carrier scheduling) for a ~~configured~~ USS set configured for scheduling of ~~in~~ PCell/PSCell)

## Agreements from RAN1#104-e

**Agreement**

When CCS from sSCell to PCell/PSCell is configured,

* Out of order scheduling is not allowed between a) PDSCH on PCell/PSCell scheduled by PDCCH on PCell/PSCell and b) PDSCH on PCell/PSCell scheduled by PDCCH on sSCell
* Out of order scheduling is not allowed between a) PUSCH on PCell/PSCell scheduled by PDCCH on PCell/PSCell and b) PUSCH on PCell/PSCell scheduled by PDCCH on sSCell

FFS: Whether this agreement requires RAN1 specification impact.

**Agreement**

When CCS from sSCell to PCell/PSCell is configured,

* Simultaneous reception of a) unicast PDSCH on PCell/PSCell scheduled from PCell/PSCell and b) unicast PDSCH on PCell/PSCell scheduled from sSCell is not allowed
* Simultaneous transmission of a) PUSCH on PCell/PSCell scheduled from PCell/PSCell and b) PUSCH on PCell/PSCell scheduled from sSCell is not allowed
* Note: Simultaneous implies full/partial time overlapping

FFS: Whether this agreement requires RAN1 specification impact.

**Agreement**

* When CCS from sSCell to PCell/PSCell is configured, CA activation/deactivation operation for the sSCell is supported

**Working Assumption**

* When CCS from sSCell to PCell/PSCell is configured, UE can be configured to monitor DCI formats 0\_1/1\_1/0\_2/1\_2 that schedule PDSCH/PUSCH on PCell/PSCell on PCell/PSCell USS set(s), and/or on sSCell USS set(s)
* The WA to be confirmed after agreements are made on PDCCH BD/CCE handling and PDCCH overbooking handling for CCS from sSCell to PCell/PSCell
* Specs also allow UEs supporting functionality of only Alt-1. Capability signaling details, if any, can be handled during the UE capability discussion for Rel17
* FFS: Whether the UE can monitor PDCCH from both cells in the same slot.

**Agreement**

* When CCS from sSCell to PCell/PSCell is configured, UE monitors ‘DCI formats 0\_0 and 1\_0 in CSS that schedule PDSCH/PUSCH on PCell/PSCell’ only on the PCell/PSCell and not on the sSCell

## Agreements from RAN1#104b-e

**Agreement**

* When CCS from sSCell to PCell/PSCell is configured
  + CIF=0 used for sSCell self-scheduling, and CIF for sSCell to PCell cross-carrier scheduling is explicitly configured using RRC signalling

**Agreement**

PDCCH overbooking on sSCell USS set(s) is not allowed

Following was captured in RAN1 Chairman notes

**For RAN1#105-e, companies are encouraged to consider:**

* Further discuss PDCCH monitoring and BD/CCE limit handling in RAN1#105e considering below BD/CCE limit handling options
  + Option A
    - At least when P(S)Cell SCS is not higher than sSCell SCS, PDCCH monitoring candidates on P(S)Cell and/or sSCell are configured such that max of (x1(m1)+x2(m1))+max of y(m2) corresponding to any P(S)Cell slots m1 and m2 is less than or equal to Z1
    - At least the case of Z1 = 44 is supported for P(S)Cell SCS 15kHz
      * FFS if Z1 larger than above can also be supported based on UE capability (e.g. similar to *BDFactorR* in Rel16)
    - FFS signalling details on how the limit Z1 is realized, e.g.
      * RRC configured BD limit/scaling factor-based limit for max(x1(m)+x2(m))
      * Separate RRC configured BD limits/scaling factor-based limits for max(x1(m)+x2(m)) and max(y(m))
      * separate BdfactorR for P(S)Cell and sSCell
      * SS configuration-based BD limit for max(x1(m)+x2(m)) and max(y(m))
      * RRC configured BD limit/scaling factor-based limit for max(x1(m)+x2(m))+ max(y(m))
      * Counting ‘sSCell-to-P(S)Cell’ scheduling as an additional scheduling cell with numerology given by sSCell numerology in determining the BD/CCE limits
    - FFS reference SCS to use when P(S)Cell has higher SCS than sSCell (if supported)
    - For sSCell scheduling P(S)Cell, the UE is not required to monitor on the active DL BWP with SCS configuration of the sSCell more than PDCCH candidates per slot of sSCell.
      * FFS how limit is computed and applied when CCS from sSCell to P(S)Cell is configured
  + Option B
    - At least when P(S)Cell SCS is not higher than sSCell SCS, For P(S)Cell slot m, PDCCH monitoring candidates on P(S)Cell and/or sSCell are configured such that x1(m)+x2(m)+y(m) is less than or equal to BD limit Z2
    - At least the case of Z2 = 44 is supported for P(S)Cell SCS 15kHz
      * FFS if Z2 larger than above can also be supported based on UE capability (e.g. similar to *BDFactorR* in Rel16)
    - max of (x1(m1)+x2(m1)) + max of y(m2) corresponding to any P(S)Cell slots m1 and m2 ~~can~~ is allowed to be larger than BD limit Z2
    - FFS signalling details on how the limit Z2 is realized
    - FFS reference SCS to use when P(S)Cell has higher SCS than sSCell (if supported)
    - For sSCell scheduling P(S)Cell, the UE is not required to monitor on the active DL BWP with SCS configuration of the sSCell more than PDCCH candidates per slot of sSCell.
      * FFS how limit is computed and applied when CCS from sSCell to P(S)Cell is configured
  + Option C
    - PDCCH monitoring candidates on P(S)Cell are configured such that max of (x1(m1)+x2(m1)) is less than or equal to Z3
      * Z3 is derived by the PDCCH monitoring capability of PCell
    - PDCCH monitoring candidates on sSCell are configured such that max of y(m2) is less than or equal to Z4
      * Z4 is derived by the PDCCH monitoring capability of sSCell
    - FFS details to define Z3 and Z4, e.g.
      * Separate RRC configured BD limits/scaling factor-based limits for max(x1(m)+x2(m)) and max(y(m))
    - For sSCell scheduling P(S)Cell, the UE is not required to monitor on the active DL BWP with SCS configuration of the sSCell more than Z4 PDCCH candidates per slot of sSCell
  + Note
    - x1(m) is #BDs for PDCCH CSS(s) candidates monitored on P(S)Cell slot m
    - x2(m) is #BDs for PDCCH USS(s) candidates monitored on P(S)Cell slot m
    - y(m) is #BDs for PDCCH USS(s) candidates monitored on sSCell in all sSCell slot(s) that overlap slot m of P(S)Cell
    - USS(s) => USS(s) that can schedule PDSCH/PUSCH on P(S)Cell)

## Agreements from RAN1#105-e

**Agreement**

Two types of UEs (Type A and Type B) can support CCS from sSCell to P(S)Cell

* For Type A UE
  + At least following search space sets on P(S)Cell and search space sets on sSCell are configured so that the UE does not monitor them in overlapping [slot/symbol] of P(S)Cell and sSCell
    - search space sets on P(S)Cell
      * USS sets for DCI formats 0\_1,1\_1,0\_2,1\_2 (if supported for Type A UE)
      * USS sets for DCI formats 0\_0,1\_0
      * Type3-CSS set(s) for DCI formats 1\_0/0\_0 with C-RNTI/CS-RNTI/MCS-C-RNTI
    - search space sets on sSCell
      * USS set(s) for scheduling P(S)Cell
  + FFS: BD/CCE handling
* For Type B UE
  + Following search space sets on P(S)Cell and search space sets on sSCell can be configured so that the UE monitors them in overlapping [slot/symbol] of P(S)Cell and sSCell
    - search space sets on P(S)Cell
      * USS sets for DCI formats 0\_0,1\_0
      * Type3-CSS set(s) for DCI formats 1\_0/0\_0 with C-RNTI/CS-RNTI/MCS-C-RNTI
    - search space sets on sSCell
      * USS set(s) for scheduling P(S)Cell
  + For handling ‘USS sets for scheduling P(S)Cell’ on P(S)Cell and/or on sSCell for DCI formats 0\_1,1\_1,0\_2,1\_2
    - Alt 2-1 is adopted
  + There is no restriction on Type-0/0A/1/2-CSS sets configurations
  + FFS: BD/CCE handling
* For Type A and/or Type B UE
  + FFS: switching to ‘normal’ PDCCH monitoring on P(S)Cell when sSCell is deactivated
* FFS: Whether Type A is specified or is Type-B with restrictions (as part of UE features discussion)
* FFS: Whether the UE can be configured with unaligned CA
* FFS: Whether the above applies for multicast PDSCH

**Discuss further in RAN1#106-e:**

* For at least Type B UE, downselect from one of the BD/CCE limit handling options below
  + [based on Option A/C] When UE is configured for CCS from sSCell to P(S)Cell and when P(S)Cell SCS () is less than or equal to sSCell SCS ()
    - On P(S)Cell (for self-scheduling)
      * UE is not required to monitor more than PDCCH BD candidates per P(S)Cell slot
      * UE is not required to monitor more than
        + Alt1

PDCCH BD candidates per P(S)Cell slot

* + - * + Alt2

PDCCH BD candidates per P(S)Cell slot

* + - On sSCell (for cross-carrier scheduling to P(S)Cell)
      * UE is not required to monitor more than PDCCH BD candidates per slot of sSCell
      * UE is not required to monitor more than
        + Alt1

PDCCH BD candidates per P(S)Cell slot

* + - * + Alt2:

PDCCH BD candidates per P(S)Cell slot

* + - At least case of is supported.
      * FFS case of
      * FFS multi-TRP case
    - FFS following
      * Selection between Alt1 vs. Alt2 above
      * Whether separate and are configured by RRC or if and only is configured
      * How the PDCCH BD candidates are distributed between multiple sSCell slots overlapping a P(S)Cell slot when and whether the BD limits for sSCell are specified per sSCell slot or per P(S)Cell slot
  + [based on Option B] When UE is configured for CCS from sSCell to P(S)Cell and when when P(S)Cell SCS () is less than or equal to sSCell SCS ()
    - On P(S)Cell (for self-scheduling)
      * UE is not required to monitor more than PDCCH BD candidates per slot of P(S)Cell
    - On sSCell (for cross-carrier scheduling to P(S)Cell)
      * UE is not required to monitor more than PDCCH BD candidates per slot of sSCell
    - Considering both PDCCH BD candidates for P(S)Cell self-scheduling on P(S)Cell and PDCCH BD candidates for sSCell to P(S)SCell cross-carrier scheduling on sSCell
      * UE is not required to monitor more than
        + Alt 1

PDCCH BD candidates per P(S)Cell slot

* + - * + Alt 2

PDCCH BD candidates per P(S)Cell slot

* + - FFS: selection between Alt-1 and Alt-2
  + FFS: whether/how the definition of or is modified compared to Rel16 when UE is configured with CCS from sSCell to P(S)Cell

## Agreements from RAN1#106-e

**Agreement**

Specification supports dormant BWP operation on sSCell for a UE is configured CCS from sSCell to P(S)Cell.

Agreement

* When CCS from sSCell to P(S)Cell is configured for a UE
  + at least the number of PDCCH monitoring candidates monitored on sSCell (for scheduling P(S)Cell) is indicated to the UE using the SS set linking approach as in Rel16
  + ~~FFS: If any modifications to Rel16 approach are introduced for~~ *~~monitoringSlotPeriodicityAndOffset, monitoringSymbolsWithinSlot, duration~~* ~~for the PDCCH monitoring candidates monitored on sSCell (for scheduling P(S)Cell)~~

Agreement

* At least for Type B UE, when the UE is configured for CCS from sSCell to P(S)Cell and when P(S)Cell SCS () is less than or equal to sSCell SCS (), and at least when UE is not provided monitoringCapabilityConfig for any cell, down select one from [based on Option A/C] or [based Option C] below
  + [based on Option A/C]
    - On P(S)Cell (for self-scheduling)
      * UE is not required to monitor more than PDCCH BD candidates per P(S)Cell slot
    - On sSCell (for cross-carrier scheduling to P(S)Cell)
      * UE is not required to monitor more than [ or ] PDCCH BD candidates per sSCell slot (Note: this is assumed per Rel16)
      * UE is additionally not required to monitor more than PDCCH BD candidates per P(S)Cell slot
    - and are based on RRC configuration and at least cases o~~f~~ are supported
    - FFS the following for [based on Option A/C]
      * Distribution of PDCCH BD candidates between multiple sSCell slots overlapping a P(S)Cell slot including whether the above additional BD limitation is defined per sSCell slot or per P(S)Cell slot.
        + Discuss further using following alternatives as starting point (other alternatives/further refinement of alternatives not precluded)

Alt1

The additional BD limitation is per sSCell slot with further limitation that UE is not required to monitor more than PDCCH BD candidates per sSCell slot

Alt 2

The additional BD limitation is per P(S)Cell slot and no further restrictions

Alt 3

The additional BD limitation is per P(S)SCell slot with below further limitation

All search space configurations monitored on sSCell for cross-carrier scheduling to P(S)Cell are within a single span of 3 consecutive OFDM symbols within a duration spanning P(S)Cell slot

* + - * Whether/how the definition of or is modified compared to Rel16 when UE is configured with CCS from sSCell to P(S)Cell
      * Whether separate and are configured by RRC or if and only is configured
  + [based on Option C]
    - On P(S)Cell (for self-scheduling)
      * UE is not required to monitor more than PDCCH BD candidates per P(S)Cell slot
    - On sSCell (for cross-carrier scheduling to P(S)Cell)
      * UE is not required to monitor more than PDCCH BD candidates per sSCell slot
    - When determining and
      * P(S)Cell self-scheduling is counted by applying scaling factor s1,
      * sSCell to PCell scheduling is counted additionally (assuming SCS of sSCell) by applying scaling factor s2
    - and
    - FFS the following
      * + Allowed combinations of s1 and s2 , and whether they are fixed or configured via RRC
        + Whether/how the definition of or is modified compared to Rel16 when UE is configured with CCS from sSCell to P(S)Cell
* FFS the following
  + Multi-TRP handling
  + PDCCH BD handling when monitoringCapabilityConfig = r16monitoringcapability is configured for any cell

**Agreement**

* Endorse below TP to 38.300 from RAN1 perspective
* Send LS to RAN2 with the TP and list of RAN1 agreements, to update Stage 2 spec are needed to reflect the RAN1 agreements

----------------------------------------- start TP1 for 38.300 v.xyz -------------------------------------------

10.8 Cross Carrier Scheduling

Cross-carrier scheduling with the Carrier Indicator Field (CIF) allows the PDCCH of a serving cell to schedule resources on another serving cell but with the following restrictions:

- ~~Cross-carrier scheduling does not apply to Pcell i.e~~. When cross-carrier scheduling from an SCell to Pcell is not configured, Pcell can only be ~~is always~~ scheduled via its PDCCH;

- When cross-carrier scheduling from an SCell to Pcell is configured, PDCCH on that SCell can schedule Pcell’s PDSCH and PUSCH, and PDCCH on the Pcell can also schedule Pcell’s PDSCH and PUSCH, and PDCCH on Pcell cannot schedule PDSCH and PUSCH on any other cell. Only one SCell can be configured to be used for cross-carrier scheduling to Pcell;

- When an SCell is configured with a PDCCH, that cell’s PDSCH and PUSCH are always scheduled by the PDCCH on this SCell;

- When an SCell is not configured with a PDCCH, that SCell’s PDSCH and PUSCH are always scheduled by a PDCCH on another serving cell;

- The scheduling PDCCH and the scheduled PDSCH/PUSCH can use the same or different numerologies.

--------------------------------------------------- end TP1 -----------------------------------------------

Draft LS [R1-2108576](file:///C:\Users\Docs\R1-2108576.zip) is endorsed in principle

Final LS [R1-2108662](file:///C:\Users\Docs\R1-2108662.zip) is endorsed

## Agreements from RAN1#106b-e

**Agreement**

Option A is supported in Rel-17

* At least for Type B UE, when the UE is configured for CCS from sSCell to P(S)Cell and when P(S)Cell SCS () is less than or equal to sSCell SCS (),[and at least when UE is not provided monitoringCapabilityConfig for any cell, ]
  + Option A
    - On P(S)Cell (for self-scheduling)
      * UE is not required to monitor more than PDCCH BD candidates per P(S)Cell slot
    - On sSCell (for cross-carrier scheduling to P(S)Cell)
      * UE is not required to monitor more than [ or ] PDCCH BD candidates per sSCell slot
      * UE is additionally not required to monitor more than PDCCH BD candidates per P(S)Cell slot
    - is based on RRC configuration
    - is used for P(S)Cell overbooking procedure
    - When determining and
      * P(S)Cell self-scheduling is counted by applying scaling factor s1
      * sSCell to P(S)Cell scheduling is counted additionally (assuming SCS of sSCell) by applying scaling factor s2
      * s1=1 and s2=0, FFS other s1 and s2
      * ~~and are based on RRC configuration~~
        + ~~FFS: additional constraints on s1 and s2 e.g., 1 ≤ s1+s2 ≤ 2 or s1 + s2 1~~
      * ~~Note: is as in Rel16~~
    - UE capability/incapability indication for below to be discussed as part of UE features discussion
      * All search space configurations monitored on sSCell for cross-carrier scheduling to P(S)Cell are within a single span of [3] consecutive OFDM symbols within a duration spanning P(S)Cell slot
    - Same approach as above is used for CCE limits
      * FFS: Separate vs. same RRC configured scaling factors (corresponding to ) for BD and CCE limits.
* When P(S)Cell SCS () is larger than sSCell SCS (), for CCS from sSCell to P(S)Cell and, it is not supported Rel-17 DSS.

**Conclusion**

* When sSCell to PCell cross-carrier scheduling is configured, DCI format 2\_6 (if configured) is monitored only on P(S)Cell

**Working Assumption**

* When CIF for sSCell to PCell cross-carrier scheduling is configured, non-fallback DCI formats on P(S)Cell include same number of CIF bits as the corresponding non-fallback DCI formats on sSCell that are used for sSCell to P(S)Cell scheduling

**Conclusion**

* A UE configured for cross-carrier scheduling from SCell to P(S)Cell can also be configured with unaligned CA (i.e., using  *ca-SlotOffset*), and a non-zero value for *ca-SlotOffset*can be configured at least for SCells other than the sSCell
  + FFS: Whether case when sSCell is configured with non-zero *ca-SlotOffset*is supported and any associated capability signalling
* Note: No additional L1 spec impact related to *ca-SlotOffset* had been identified

**Conclusion**

* When CCS from sSCell to P(S)Cell is configured for a UE
  + monitoringSlotPeriodicityAndOffset, monitoringSymbolsWithinSlot, duration for the PDCCH monitoring candidates monitored on sSCell as determined per Rel16 SS linking approach

Agreements from “UE features for DSS” Agenda Item

**Agreement**

The agreements listed in Section 6 of R1-2109917 are endorsed.

## Agreements from RAN1#107-e

**Agreement**

If no additional set of (s1, s2) is introduced,

* For Option A BD/CCE limit handling and (s1=1, s2=0) agreed in RAN1#106bis-e, ~~down-select from~~
  + Option 2
    - On sSCell (for cross-carrier scheduling to P(S)Cell)
      * UE is not required to monitor more than PDCCH BD candidates per sSCell slot

**Agreement**

* BD/CCE limits for Type B UEs are applicable for Type A UEs supporting cross-carrier scheduling from sSCell to P(S)Cell

**Agreement**

* Following approaches for PDCCH monitoring and BD limit handling is supported for Type A UE
  + - Additional simplifications to PDCCH monitoring
      * Type A UE as per RAN1#105-e agreement and
        + no simultaneous monitoring between ‘USS sets (for P(S)Cell scheduling) on sSCell’ and ‘Type 0/0A/1/2/CSS sets on P(S)Cell for DCI formats with CRC scrambled by C-RNTI/MCS-C-RNTI/CS-RNTI’
        + simultaneous monitoring of ‘USS sets (for P(S)Cell scheduling) on sSCell’ and ‘Type 0/0A/1/2/CSS sets on P(S)Cell for DCI formats with CRC not scrambled by C-RNTI/MCS-C-RNTI/CS-RNTI’

Agreement

Confirm the WA from RAN1#106bis-e with addition of below Note (shown in blue)

***Working Assumption***

* *When CIF for sSCell to Pcell cross-carrier scheduling is configured, non-fallback DCI formats on P(S)Cell include same number of CIF bits as the corresponding non-fallback DCI formats on sSCell that are used for sSCell to P(S)Cell scheduling*
* Note: per RAN1#102-e agreement, when sSCell to P(S)Cell scheduling is configured for the UE, cross-carrier scheduling from P(S)Cell to another cell is not allowed. The CIF bits included in non-fallback DCI formats on P(S)Cell are considered reserved.

**Agreement**

* When CCS from sSCell to P(S)Cell is configured for the UE,
  + Multiple CORESET pools are not configured for PDCCH monitoring on P(S)Cell and not configured for PDCCH monitoring on sSCell;
  + Other Scells can be configured with multiple CORESET pools

**Agreement**

* For Option A BD/CCE limit handling agreed in RAN1#106bis-e
  + Value of parameter for BD limit handling is configured via RRC from a set of
    - 8 possible values

**Agreement**

* For Option A BD/CCE limit handling agreed in RAN1#106bis-e
  + For CCE limit handling (i.e., scaling of maximum number of non-overlapping CCEs)
    - same parameter agreed for BD limit handling is used

**Agreement**

* Alt1: When CCS from sSCell to P(S)Cell is configured for the UE,
  + r16monitoringcapability is not configured for PDCCH monitoring on P(S)Cell and not configured for PDCCH monitoring on sSCell;
  + r16monitoringcapability can be configured for PDCCH monitoring on Scells other than sSCell

## Agreements from RAN1#107b-e

Topic not included in agenda for this meeting