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

**eMeeting, Feb 21 – Mar 03, 2022**

**Source: Moderator (Ericsson)**

**Title: Summary#3 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 |
| Ericsson1 | OK with Proposal 1 or [2/14, 3/14, 4/14, 5/14, 6/14, 8/14, 10/14, 12/14] as proposed in our contribution. Also OK to keep just one reserved value. Functionality of alpha=1 can be captured as disabling alpha (if needed), so no need to use codepoint for it. |
| Lenovo | To support 16 CCEs on PCell, we can have 4/14 included. We slightly prefer not to have ‘1’ included as that essentially is equivalent to disabling the feature. |
| OPPO | We are fine with the proposal. |

**Discussion Point 1v2**

* Companies are requested to provide their view on below alternatives to finalize [reserved1], [reserved2] from Tue GTW agreement
  + Alt1: 4/7, 6/7
  + Alt2: 4/7, reserved
  + Alt3: leave both as reserved

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

|  |  |  |
| --- | --- | --- |
| **Company Name** | **Preferred Alternative(s)** | **Comments (Proposal 1v2)** |
| Moderator notes2 |  | Intention of Proposal 1v2 is to finalize [reserved1], [reserved2] from Tue GTW agreement |
| Intel |  | We don’t see a strong necessity for either value. |
| Qualcomm | Alt.3  (or Alt.2 as a compromise) | Agree with Intel. If majority prefers, we can compromise to 4/7 to fill-in the middle value between 1/2 and 5/7. |
| Samsung | {4/7, 5/14} or Alt-2 | Suggest {4/7, 5/14} to achieve higher granularity for smaller values, otherwise prefer Alt-2. |
| ZTE |  | For progress, we can live without value “1”. Regarding the value, we can accept Alt.1 or {4/7, 5/14} as suggested by Samsung |
| MTK | Alt. 1 or Samsung proposal | We prefer Alt. 1 or Samsung’s version. |
| Huawei, HiSilicon | Alt1 | It is agreed that on PCell for self-scheduling, UE is not required to monitor more than non-overlapping CCEs per P(S)Cell slot.  When , introducing more values of will make the configuration of the base station more flexible, because may not be an integer multiple of 56. |
| Xiaomi |  | Alt.1 or Samsung’s version. |
| Nokia, NSB | Alt. 1 or Samsung proposal | We prefer Alt. 1 or Samsung’s version. |
| Ericsson2 | Prefer Alt1, OK with Alt2 or Alt3 | If picking 8 values we prefer to have a few with alpha>0.5.  Considering both CSS and USS on P(S)Cell, it would not be unusual to retain around 10-15 BDs for P(S)Cell self-scheduling. For scenarios with large number of CCs, and UEs indicating only basic BD capability (i.e., 4), the resulting available BDs for P(S)Cell scheduling would be small and larger values of alpha would be suitable. For example, FR1+FR2 CA with one15kHz CC + one 30kHz CC + eight FR2 CCs, the number of BDs for 15kHz CC would 44\*(4/10)= 17BDs and to reserve 12-15 BDs for P(S)Cell, larger alpha values (e.g. 6/7) are useful. Also, it should be noted that offloading more/less #BDs to sSCell does not automatically correlate with offloading more/less PDCCH load to sSCell. That depends on actual scheduling of PDCCHs. |
| Moderator Notes |  | Please continue discussion using current Table. |
| Intel |  | We share views from Ericsson, larger alpha value is necessary considering large number of CA cells and the limitation from number of CCEs of Type0-CSS on PCell. The number of CCE for Type0-CSS can be up to 28 (32 CCEs for CORESET of 96 PRBs & 2 symbols).  Considering the following figure from Huawei, the total number of CCE for PCell, i.e. . Only one agreed value 5/7 is applicable to support 28 CCEs on PCell. 44\*5/7=31, which means we could offload 44-31=13 CCE to sCell.    On the other hand, if there are 6 CCs, 1 CCs with SCS 15 kHz (the PCell) and 5 CC with SCS 30 kHz (including the sSCell), . No agreed alpha value can be result in 28 CCEs on PCell. If 6/7 is considered, it gives 27\*6/7=31 CCEs. It also means 6 CCEs can be offload to sSCell.  If a single new alpha value is introduced, we prefer to adopt 6/7. |
| Qualcomm |  | Regarding the Ericsson scenario (FR1+FR2 CA with one15kHz CC + one 30kHz CC + eight FR2 CCs and pdcch-BlindDetectionCA = 4), BD/CCE for {P(S)Cell, sSCell} are following:  Scaling factor  = 5/7 🡺 P(S)Cell has 12BDs/16CCEs, sSCell has 5BDs/6CCEs  Scaling factor  = 6/7 🡺 P(S)Cell has 15BDs/19CCEs, sSCell has 2BDs/3CCEs  5/7 enables the 12 BDs which falls in the range of 12-15 BDs already and hence, should be OK.  To begin with, in this scenario, the BD/CCE budget for 15kHz DSS CC is quite limited. It does not make sense to keep many BDs/CCEs on P(S)Cell while configuring UE with cross-carrier scheduling from a SCell. It is more reasonable to (1) reduce BDs on P(S)Cell a bit, or (2) simply switch P(S)Cell from the 15kHz DSS CC to the 30kHz CC.  Regarding Intel’s scenario, we think 5/7 is a reasonable max value. Following does not justify that a UE has to support two scheduling cells for a scheduled cell only for such small numbers of BDs/CCEs on sSCell.  Scaling factor  = 5/7 🡺 P(S)Cell has 20BDs/26CCEs, sSCell has 9BDs/11CCEs  Scaling factor  = 6/7 🡺 P(S)Cell has 25BDs/32CCEs, sSCell has 4BDs/5CCEs |
| Huawei, HiSilicon | Alt1 | It is preferred to keep certain level of PCell self-scheduling considering more functions relying on PCell and the lower SCS with higher coverage/reliability. It is not easy from deployment point of view to simply change the PCell from 15khz CC to 30khz CC, otherwise, there is no need for this whole DSS enh WI. |
| Samsung |  | For progress, fine to keep both values reserved or pick any one/two additional “small” values. No need to spend more time on this – the current values are enough and even having a total of 4 values could have been enough. |
| CMCC | Alt 1 | In order to adapt to different scenarios, it is necessary to consider the case of offloading PDCCH monitoring to sSCell at a larger or smaller scaling factors. According to the analysis of the company above, the values in Alt 1 seems reasonable. |
| vivo |  | Agree with Samsung |
| Xiaomi |  | Based on our observation, network vendors and operators has strong interest on alt 1. Considering more scaling factors doesn’t increase complexity but can provide more flexibility, we agree with HW and CMCC |

### Proposal 1v3

* Update (RRC parameter *PCell-CCSscaling* in RAN1 specs) value set as below
  + {1/7, 3/14, 2/7, 3/7, 1/2, 5/7, ~~[reserved1]~~ 4/7, ~~[~~reserved~~2]~~}

|  |  |  |
| --- | --- | --- |
| **Company Name** | **Support/Not Support** | **Comments (Proposal 1v3)** |
| Moderator notes4 |  | Based on inputs for Discussion point 1v2, there seem to be no concerns raised with at least alpha=4/7. Many companies prefer to use all 8 values, but given the discussion, having 7 values + 1 reserved (i.e., Alt2) appears like a possible compromise. |
| Intel |  | Perhaps we can hold on this proposal for a moment until an agreement/conclusion is make for proposal 5v2. If additional values of s1/s2 are agreed, there is less motivation for high alpha value (help for CSS transmission on PCell, but hurt sSCell PDCCH flexibility too) |
| Qualcomm |  | We are OK with the proposal. |
| MTK |  | We are OK with the proposal. |
| Spreadtrum |  | We are OK with the proposal. |
| Samsung |  | We are OK with the proposal. |
| Ericsson4 |  | OK with the proposal. |
| Xiaomi |  | We are OK with the proposal. |
| Moderator notes5 |  | Except Intel other companies seem to be OK. At least in my understanding, regardless of progress on other proposals, no concerns were raised for the proposed value ‘4/7’. Considering discussions so far, hopefully the current Proposal can be finalized if OK with Intel |
| ZTE |  | OK with the proposal. |
| OPPO |  | OK with the proposal. |
| vivo |  | We are OK with the proposal |
| MTK |  | OK with the proposal. |

**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 |
| Ericsson1 | Support.  As discussed in our contribution, most of the DCI fields would have same size but some fields can be different. For example, DCI fields based on PDCCH-Config of the scheduling cell can have different size/presence based on respective PDCCH-Config of P(S)Cell and sSCell. Also considering the new DCI fields being introduced for Rel17 (e.g. the ‘PDCCH monitoring adaptation’ field), we think Proposal 2 is good approach.  With respect to per-field size alignment, some of the DCI fields may have to defined as reserved to avoid the mismatch in RRC configuration/UE capability associated with P(S)Cell and sSCell for each UE. Overall, Proposal 2 seems simpler. |
| Lenovo | Support. Agree with CMCC. |
| OPPO | Ok with the proposal. |
| Moderator Notes2 | Please continue further discussion using current table. Considering inputs so far (summarized below), hopefully we can converge on current Proposal 2.  @Qualcomm – “PDCCH monitoring adaptation indication – 0, 1 or 2 bits” in DCI formats 0\_1, 0\_2,1\_1,1\_2 is one more field that can result in size mismatch? Also, ‘SCell dormancy Indication’ if Alt1 is chosen in Discussion Point 7.  @Spreadtum, Apple – CIF handling already captured in 38.212 h.0.0 and no change to that is required due to Proposal 2. |
| Intel | We can be fine with Proposal 2 for progress |
| Qualcomm | OK, due to the possible misalignment handling that may occur due to the combination of the other WI(s), we can accept the Proposal 2.  We are also OK to keep the CIF handling captured in 38.212 h.0.0. |
| ZTE | We can be fine with Proposal 2 for progress |
| MTK | Support Proposal 2 |
| Spreadtrum | Thanks for clarification.  We support the proposal. |
| Huawei, HiSilicon | We are fine with Proposal 2. This although does not necessarily change 212 about CIF, but turns out to say the previous alignment of one CIF field is not necessary. If this is correct understanding, we’d prefer to remove that restriction to simplify spec and also implementation, since we anyway need to update 212 now. |
| Moderator Notes3 | Proposal seems to be stable.  Revising CIF agreement does not seem to be necessary. |
| Huawei, HiSilicon | We still think it is worthwhile to replace the previous conclusion about CIF with this agreements. There is no need for implementation team to check a single field while which can be ensured by the current proposal already. It is also redundant in the spec. |
| Samsung | Support “Moderator Notes3” above. |
| Moderator notes4 | Proposal 2 seems to be stable.  Please provide any further comments on HW/HiSi suggestion using current table. |
| MTK | We agree with HW’s view. With Proposal 2 agreed, the previous conclusion about CIF seems to become redundant, which makes DCI size alignment a two-step procedure (CIF alignment 🡪 |X-Y| alignment), while actually a simple one step (|X-Y| alignment) procedure is enough. Anyway, Proposal 2 is agreed and CIF handling can be a separate discussion. |
| Moderator Notes5 | Agreed on [108-e-NR-DSS-01] email thread  **Agreement**   * 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 |

**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

|  |  |
| --- | --- |
| **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. |
| Ericsson1 | Prefer Alt 1. Also OK with Alt 2. |
| OPPO | Alt-2. |

**Discussion Point 3v2**

* Companies are requested to provide their view on below alternatives for SS set linking for CCS from sSCell to P(S)Cell
  + Alt1
    - When UE is configured for CCS from sSCell to P(S)Cell, and if SS set (x\_p) of P(S)Cell and SS set (x\_s) of sSCell are configured with same *searchSpaceId* value
      * x\_s is used for CCS from sSCell to P(S)Cell (Note: already agreed)
      * if parameters other than *searchSpaceId* and *nrofCandidates* are configured for x\_p
        + x\_p is used for P(S)Cell self-scheduling
      * if parameters other than *searchSpaceId* and *nrofCandidates* are not configured for x\_p
        + x\_p is not used for P(S)Cell self-scheduling
  + Alt2
    - When UE is configured for CCS from sSCell to P(S)SCell, and if SS set (x\_p) of P(S)Cell and SS set (x\_s) of sSCell are configured with same *searchSpaceId* value
      * x\_s is used for CCS from sSCell to P(S)Cell (Note: already agreed)
      * x\_p is not used for P(S)Cell self-scheduling and parameters other than *searchSpaceId* and *nrofCandidates* are not configured for that SS set

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| **Company Name** | **Comments (Discussion Point 3v2)** |
| Moderator notes2 | The alternatives in Discussion Point 3 updated in 3v2 using example notation to further clarify intended behavior.  Following agreed in Tue GTW |

**Proposal 4 (Conclusion?)**

* For a UE configured with cross-carrier scheduling from a SCell to Pcell/PSCell, *enableDefaultBeamForCCS* can be configured in *CrossCarrierSchedulingConfig* 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. |
| Ericsson1 | OK. |
| OPPO | Ok with the proposal. |
| Moderator Notes2 | Following agreed in Tue GTW |

**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

|  |  |
| --- | --- |
| **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. |
| Ericsson1 | OK with Alt 1. |
| OPPO | Prefer Alt-1.  Because the capabilities on PCell and sSCell are defined based on PCell slot, these two capabilities should be included in the total capability of the cell set with same SCS configuration with PCell (s1=1, s2=0). |
| Moderator Notes2 | Please continue discussion using current Table. |
| Intel | We still prefer to have an option to mitigate the limitation from splitting CCE budget to two scheduling cells. |
| Samsung2 | There has been no agreement or conclusion that other (s1,s2) values are de-prioritized – again reminding the group of the agreement in RAN1#107-e “*If no additional set of (s1, s2) is introduced…*”.  S2 = 0 does not reflect that sSCell is a scheduling cell for P(S)Cell, and that’s why RAN1 had to adopt lengthy spec different from Rel-15/16 to specify (s1=1,s2=0), including the usage of instead of the Rel-16 limit So, combinations with s2 > 0 are preferred.  Alt 2-2 maintains the total BD/CCE budget, while adding flexibility for gNB allocation of PDCCH candidates between P(S)Cell and sSCell, as expected for DSS. The spec impact will be minimal, since existing text in TS 38.213 Clause 10.1.1 can be retained for (s1=1,s2=0), and some minimal text can be added based on Rel-16 to support the additional (s1,s2) value. |
| NTT DOCOMO | Considering the current situation, we prefer Alt 1. |
| Huawei, HiSilicon | We still prefer Alt2 to introduce the additional values for (s1, s2) that are configured via RRC.  In the typical case of Pcell SCS 15 kHz and sSCell SCS 30 kHz in DSS, (s1=1,s2=0) is unsuitable for the UE(Cap B-2 UE) who uses BDs/CCEs for 15 kHz CC group for self-scheduling of Pcell and ***additionally/separately*** uses BDs/CCEs for 30 kHz CC group for cross-carrier scheduling from sSCell to Pcell.  An example in our contribution:  Assume the scenario that the UE is configured with 5 CCs: 1 CCs with SCS 15 kHz (the Pcell) and 4 CC with SCS 30 kHz (including the sSCell).    Figure 4. CA configuration with multiple CCs using SCS of 30 kHz  When (s1=1, s2=0) is used  , .  According to the agreements that is suitable for Cap B-1 UE, on Pcell (for self-scheduling)   * UE is not required to monitor more than PDCCH BD candidates per Pcell slot. When the target PDCCH offloading ratio is 50%, which means the network aims to keep about 50% BDs for Pcell self-scheduling, i.e.,   According to Cap B-2 UE implementation   * The BD limit for 15 kHz CC group per 15 kHz slot is . Since there is only one cell with SCS configuration 15 kHz in this example, i.e., the Pcell, Cap B-2 UE reserves 35 BDs on Pcell per 15 kHz slot for self-scheduling.     Note that when is 0.5, 18(=35-17) of these 35 BDs that is capable by Cap B-2 UE will be wasted if requirement designed for Cap B-1 UE is implemented for the same UE. When the value of is smaller, the number of wasted BDs will be larger. |
| Moderator Notes3 | Please continue discussion using current Table. |
| Intel | We prefer Alt2 to introduce the additional values for (s1, s2). As we commented earlier, hard split of CCE budget on PCell and sSCell causes strong limitations. Note: the minimum number of CCE that must be reserved on PCell is at least limited by Type0-CSS on PCell. The number of CCE for Type0-CSS can be up to 28 (32 CCEs for CORESET of 96 PRBs & 2 symbols).  Using Huawei’s example for (s1=1, s2=0), which was already used by many companies including proponent of (s1=1, s2=0), the number of CCE budget for PCell is . That means, we can only offload 16 CCEs to sSCell. On the other hand, if there are 6 CCs, 1 CCs with SCS 15 kHz (the Pcell) and 5 CC with SCS 30 kHz (including the sSCell), . At most 9 CCEs can be offloaded to sSCell. We don’t know how 9 CCEs can support efficient scheduling from sSCell.  With the above analysis, additional values for (s1, s2) with s2>0 will be really beneficial. Alt 2-2 (s1=1, s2=1) will be the best from scheduling flexibility point of view. We are supportive to Alt 2-2. To allowed better control for gNB, it would be also preferrable to allow other values of (s1<=1, s2<=1) |
| Huawei, HiSilicon3 | Based on the discussion above, some companies agree that introducing new (s1, s2) will bring better scheduling flexibility, but fear that it will lead to complex protocol modifications. In fact, the modification of the protocol is not complex if only new (s1, s2) are introduced.  The TP for introducing new (s1, s2) can be:   |  | | --- | | **------------------------------   TP#1: TS 38.214 -----------------------------------**  \*\*\* Unchanged text is omitted \*\*\* 10.1.1 Self-carrier and cross-carrier scheduling on the primary cell A UE can be configured for scheduling on the primary cell from the primary cell and from a secondary cell [12, TS 38.331]. The UE is either not provided *monitoringCapabilityConfig* or the UE is provided only *monitoringCapabilityConfig* = *r15monitoringcapability* for the primary cell and for the secondary cell. The UE is not provided *coresetPoolIndex* on the primary cell or on the secondary cell.  The SCS configuration for the active DL BWP on the primary cell is smaller than or equal to the SCS configuration for the active DL BWP on the secondary cell.  If , UE determines and , and determines and , by ~~including~~counting the primary cell ~~only~~as s1 in the downlink cells and counting the primary cell as s2 in the downlink cells in , as described in clause 10.1. If , the UE determines and by including the primary cell once in the downlink cells in , as described in clause 10.1.  \*\*\* Unchanged text is omitted \*\*\* |   We propose to agree Alt 2-1 and Alt 2-2 (Alt 2-3 is a special case of Alt 2-1). |
| Samsung3 | To help converge the discussion, suggest to introduce an RRC parameter with the four values proposed by companies.  **Proposal:** **For a UE configured with CCS from sSCell to P(S)Cell, introduce an RRC parameter (s1,s2) for counting the P(S)Cell towards and .**   * **Candidate values are** * **FFS: whether to define new UE capability for values other than (1,0).** |
| LG Electronics | As shown by Huawei and Intel’s analysis, adopting Alt 2 is proven as beneficial in terms of scheduling flexibility. In that sense, we still prefer Alt 2 and support Samsung’s proposal. |
| Nokia, NSB | This should not be a big controversy, at least we can be flexible and OK with Alt Samsung proposal, or alt 2-1/2-2/2-3, or stay with Alt1. |

### Proposal 5v2

* For a UE configured with CCS from sSCell to P(S)Cell,
  + Introduce an RRC parameters (s1, s2) for counting the P(S)Cell towards and .
    - Candidate values for
    - Default value if not configured is (s1=1, s2=0)
  + Introduce new UE capability to indicate support for (s1, s2) values other than (s1=1, s2=0)

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

|  |  |  |
| --- | --- | --- |
| **Company Name** | **Support/Not Support** | **Comments (Proposal 5v2)** |
| Moderator notes4 |  | Proposal 5v2 based on inputs to Discussion Point 5 from proponents of Alt 2. Intention is to check whether above ‘complete proposal’ can be supported.  If agreed, corresponding TP to 38.213 sub clause 10.1.1 is needed and example is provided by Huawei, HiSilicon3 for Discussion Point5. Any comments on TP are also welcome. |
| Intel | Y | We support the proposal.  As we commented before, due to the large number of CCEs for Type0 CSS on PCell, e.g. up to 28 CCEs, the possible BD/CCE offloaded to sSCell will be quite limited. We don’t believe 3, 4 or 9 CCEs on sSCell can support a flexible PDCCH transmission practically. |
| LG Electronics | Support | We support the proposal and share the view from Intel. |
| Qualcomm |  | We think some more discussion and clarification are necessary.  As we can find the discussion in R1-2200914 (Huawei, HiSilicon), it is understandable that there can be an argument that the UE supporting R16 cross-carrier scheduling from higher-SCS to lower-SCS should be able to support (s1, s2) other than (1, 0). However, we do not think the Proposal 5v2 is complete and clarification is necessary.   1. The candidate set(s) of (s1, s2) other than (1, 0)   We think s1 + s2 = 1 is a necessary condition. S1 + s2 >1 such as (1, 1) reduces/impacts the BD/CCE budget of the irrelevant SCS (e.g., 120kHz) and hence should not be considered.  We think (, 1) (6 sets according to Proposal 1v3) is too much and is not justifiable. Besides, it is not clear to us the benefit of using the common parameter  for both BD/CCE split and (s1, s2) determination.  Therefore, we consider we can focus only on (s1, s2) = (0.5, 0.5) as additional (s1, s2) for this discussion.   1. Complete proposal   In our understanding, the Proposal 5v2 with the Huawei’s above TP would not be the complete proposal to accommodate the new (s1, s2). For example, we wonder whether/how proponents want to change the following agreement.   * 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  1. UE capability for (s1, s2) other than (1, 0)   Assuming that the proposal is based on the UE’s implementation of cross-carrier scheduling from higher-SCS to lower-SCS, we believe (s1, s2) other than (1, 0) clearly requires separate FG (as already addressed in Proposal 5v2). Perhaps R16 cross-carrier scheduling from higher-SCS to lower-SCS should be the prerequisite for this new FG, but such details can be discussed in UE feature session (if agreed). |
| MTK |  | We share similar view with QC, while we are open to discuss the proposal. As QC mentioned, (s1, s2)=(1, 1) imposes more UE computing complexity than (s1, s2)=(0.5, 0.5). Hence, for the following sentence in the proposal:   * Introduce new UE capability to indicate support for (s1, s2) values other than (s1=1, s2=0)   Does it mean for each additional pair of (s1, s2), RAN1 would introduce one additional bit for UE indication? |
| Spreadtrum |  | OK with QC clarification. |
| Samsung | Support | The proposal is meant to be a compromise to achieve consensus among companies and address the concerns (such as UE capability). There are drawbacks with any of the four candidate values, including (s1=1, s2=0), and that is another reason why including all four values makes sense. We prefer to keep at least (s1=1, s2=1). The UE feature is adopted to indicate corresponding support on the UE side, and the gNB has the flexibility to select a suitable (s1, s2) value, for example, based on the SCS configurations.  Regarding impact on the BD/CCE handling, the only change may be w.r.t. the limit for CCS from sSCell to PCell. We already resolved the highlighted limit to the latter for the case of (s1=1, s2=0). We prefer to apply Rel-16 limit for other (s1, s2) values but can also be OK with keeping the existing behavior.   * 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   Details of UE capability can be discussed in the UE feature discussion, such as whether the additional (s1, s2) values are captured as candidate values for a new component within FG 34-1/2 or whether new FG is needed, as well as how to indicate the support for additional (s1, s2) values. The bottom-line which is needed for this agreement is that, UE can report its capability for the (s1, s2) values it can support and that is already captured in the FL proposal. |
| Ericsson4 |  | Current PDCCH BD/CCE handling is as below   * *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)*   + *<* when (s1=1, s2=0) *> UE is not required to monitor more than PDCCH BD candidates per sSCell slot*   + *UE is additionally not required to monitor more than PDCCH BD candidates per P(S)Cell slot*   If above is unchanged, we do not see flexibility gains for additional configuration of s1,s2 values (over existing s1,s2=1,0). We want to check proponents view on expected benefits if above is unchanged.  As commented by QC, the spec impact of adding additional values of s1,s2 on above is not clear to us as well and it needs to be clarified to have a complete proposal. i.e., if changes to above are to be introduced, specifically which conditions are updated and which conditions are still retained?  On the values, if intention is to increase flexibility, there does not seem to be much motivation for values other than s1=1,s2=1.  On UE capability, our understanding is that (as proposed in 5v2) new UE capability should be introduced to indicate support for (s1, s2) values other than (s1=1, s2=0) if they are agreed. Existing FGs 34-1 and 34-2 do not support values other than (s1=1, s2=0). |
| Samsung2 |  | As mentioned before, the only change may be w.r.t. resolving the bracket for (s1,s2) values other than (1,0). To enable BD/CCE offloading from P(S)Cell to sSCell, the Rel-16 limit can be re-used which is consistent with selection of s2 > 0.   * On sSCell (for cross-carrier scheduling to P(S)Cell)   + UE is additionally not required to monitor more than PDCCH BD candidates per P(S)Cell slot   + UE is not required to monitor more than [ ~~or~~ ] PDCCH BD candidates per sSCell slot   This can be sufficient for a RAN1 agreement, but if a TP is sought for, the following may be used as a reference.  10.1.1 Self-carrier and cross-carrier scheduling on the primary cell  A UE can be configured for scheduling on the primary cell from the primary cell and from a secondary cell [12, TS 38.331]. The UE is either not provided *monitoringCapabilityConfig* or the UE is provided only *monitoringCapabilityConfig* = *r15monitoringcapability* for the primary cell and for the secondary cell. The UE is not provided *coresetPoolIndex* on the primary cell or on the secondary cell.  The SCS configuration for the active DL BWP on the primary cell is smaller than or equal to the SCS configuration for the active DL BWP on the secondary cell.  If , the UE determines and , and determines and , by including the primary cell ~~only~~ as *s1* in the downlink cells and as *s2* in the downlink cells in , as described in clause 10.1, where (*s1*, *s2*) is provided by [RRC parameter]. If , the UE determines and by including the primary cell once in the downlink cells in , as described in clause 10.1.  For scheduling on the primary cell from the primary cell, the UE is not required to monitor more than PDCCH candidates per slot or more than non-overlapping CCEs per slot on the active DL BWP of the primary cell, where is provided by *PCell-CCSscaling*.  For scheduling on the primary cell from the secondary cell, the UE is not required to monitor on the active DL BWP of the secondary cell more than  - PDCCH candidates per slot or more than non-overlapping CCEs per slot of the active DL BWP of the secondary cell when (s1,s2) = (1,0), or PDCCH candidates per slot or more than non-overlapping CCEs per slot of the active DL BWP of the secondary cell when (s1,s2) ≠ (1,0)  - PDCCH candidates per slot or more than non-overlapping CCEs per slot of the active DL BWP of the primary cell  If and (s1,s2) = (1,0), the UE does not count PDCCH candidates and non-overlapping CCEs that the UE monitors for scheduling on the primary cell from the secondary cell towards and , respectively.  If and (s1,s2) = (1,0), the UE counts PDCCH candidates and non-overlapping CCEs that the UE monitors for scheduling on the primary cell from the secondary cell towards and , respectively.  [If and (s1,s2) ≠ (1,0), the UE counts PDCCH candidates and non-overlapping CCEs that the UE monitors for scheduling on the primary cell from the secondary cell towards and , respectively.]  For allocation of PDCCH candidates and non-overlapping CCEs to search space sets for scheduling on the primary cell from the primary cell, the UE applies the procedure in clause 10.1 using instead of , and using instead of for the primary cell. |
| Xiaomi |  | We agree with Qualcomm’s clarification, i.e. s1+s2 should be equal to 1 if additional (s1,s2) combinations other than (s1=1, s2=0) are supported. We are also curious why scaling factor should be tied with S1 and S2. It is obviously and S has totally different functionality.  The issue raised by Ericssion should also be carefully investigated. Supporting additional (s1,s2) combination seems need more work, e.g. how to determine the cap of BD/CCE on the scheduling SCell.  We are generally fine with the TP from Samsung. |
| Moderator notes5 |  | Please continue discussion using current table especially on allowed additional (s1,s2) values, spec impact/benefits. |
| ZTE |  | We are open to consider values other than s1=1 and s2=0, especially for value . It is preferred to keep the previous principle s1+s2=1.  If (s1,s2) values other than (1,0) is introduced, Option C based [in the agreement in RAN1#106-e] BD/CCE limit determination should be adopted accordingly. The only difference is that we should only apply the scaling factor for M\_max but not for M\_total. Also, we can further discuss whether to apply s1/s2 or alpha/beta M\_max in the following.   * + [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 |
| vivo |  | We agree with QC that the proposal is not complete by just changing the s1 and s2 value.  The change of BD/CCE budget calculation behind each s1 and s2 value is different.  For example, for s1=alpha and s2=1-alpha, agree with ZTE that it is exactly Option C. |
| MTK |  | To move things forward, if RAN1 can introduce one additional bit for each additional pair of (s1, s2), we can be open to accept additional (s1, s2) pairs. The corresponding spec impact can be further clarified in May meeting. |

**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

|  |  |
| --- | --- |
| **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. |
| Ericsson1 | OK in principle. If UE capability is introduced, prefer to also have associated RRC configuration. Regarding timing details, further clarification is needed, e.g., we prefer to not include Pswitch. |
| Lenovo | In our view, the proposal would provide an upper bound on the required time to perform the behaviour change. In our view, is scaled to provide slots from Pcell perspective. |
| OPPO | In our view, the proposal leaves two enablers now for the UE to determine its CCS behavior: SCell activation/deactivation or switch between dormant/non-dormant; and enable/disable of scaling factor. Adding a timeline individually to the second enabler complicates the UE behavior logic. |
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**Proposal 6-1v2**

* When UE is configured for CCS from sSCell to P(S)Cell, scaling factor is not applied for PDCCH overbooking/BD/CCE limit computation when sSCell is deactivated; otherwise scaling factor is applied
  + Timing for disabling scaling factor follows sSCell deactivation timing in current specifications
  + Introduce separate FG to indicate UE support for disabling scaling factor when sSCell is deactivated
* When UE is configured for CCS from sSCell to P(S)Cell, scaling factor is not applied for PDCCH overbooking/BD/CCE limit computation when sSCell is switched to dormant BWP
  + Timing for disabling scaling factor follows the non-dormant to dormant BWP switching delay in current specifications
  + Introduce separate FG to indicate UE support for disabling scaling factor when sSCell is switched to dormant BWP

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| **Company Name** | **Comments (Proposal 6-1v2)** |
| Moderator notes2 | Updated to v2 based on company inputs.  @Intel, MTK, vivo – If timing can be determined in RAN1 there is no need for RAN4 input? Note – there are no RAN4 TUs for the WI and extra work to RAN4 should be avoided. |
| Intel | We generally support the proposal. One clarification on the proposal, does it mean sSCell deactivation/dormancy is a separate FG and disabling scaling factor must be one component of the separate FG |
| LG Electronics | Support |
| Qualcomm | We are in general OK with the proposal for sSCell deactivation/dormant BWP.  One clarification: the proposal does not include the cases where the sSCell is being activated or sSCell BWP is switched to non-dormant BWP. Does this mean that there is no specific requirement on when to enable the scaling factor ? We are fine with this but would like to confirm. |
| Samsung | OK with the proposal in principle. Agree that existing timeline in RAN1/4 can be re-used without need for new RAN4 input, which include both activation/deactivation, and dormant/non-dormant.  But, there is no need for separate FGs, since SCell deactivation/dormancy are existing Rel-16 UE features, and no new operation is expected. This can be anyways discussed in the UE feature agenda, so no need to capture here.   * When UE is configured for CCS from sSCell to P(S)Cell, scaling factor is not applied for PDCCH overbooking/BD/CCE limit computation when sSCell is deactivated   + Timing for disabling scaling factor follows sSCell deactivation timing in current specifications   + ~~Introduce separate FG to indicate UE support for disabling scaling factor when sSCell is deactivated~~ * When UE is configured for CCS from sSCell to P(S)Cell, scaling factor is not applied for PDCCH overbooking/BD/CCE limit computation when sSCell is switched to dormant BWP   + Timing for disabling scaling factor follows the non-dormant to dormant BWP switching delay in current specifications   + ~~Introduce separate FG to indicate UE support for disabling scaling factor when sSCell is switched to dormant BWP~~ |
| NTT DOCOMO | Support |
| ZTE | Agree with the proposal in principle and share similar view as Samsung that the UE feature can be discussed separately. |
| MTK | We are generally fine with the proposal but want to clarify what is the transient behavior of α on P(S)Cell during SCell deactivation or SCell BWP switch time. To our understanding, during these time durations, UE still monitors P(S)Cell with the α scaling (where α<=1). |
| Qualcomm2 | From our point of view, ‘enabling/disabling the scaling factor ’ is obviously a new operation (compared to legacy SCell deactivation/dormancy) and hence we need the separate FGs for this for deactivation/dormancy.  Since this proposal introduces the new features at this late stage (in maintenance phase), we have to be careful about the impact from the agreement to the FGs. We think whether or not to introduce a new FG should be cleared when the agreement is made.  As we stated already, we believe the sub-bullets “Introduce separate FG …” are necessary. We are OK to discuss details of the FGs in the UE feature sessions. If the sub-bullets are deleted as Samsung proposed above, we do not agree with the proposal. |
| Spreadtrum | We support the proposal.  Same comments as Qualcomm that timing for enabling scaling factor can be included. Our understanding is the following:   * + Timing for enabling scaling factor follows sSCell activation timing in current specifications   + Timing for enabling scaling factor follows the dormant to non-dormant BWP switching delay in current specifications |
| Huawei, HiSilicon | Support |
| Xiaomi | Thanks for the update and the current version is much cleared. After hearing the comments from companies, it seems we have the common understanding on the functionality of scaling factor α. However, our request on clarification is not satisfied. As we comment in the first round, we would like to understand how the enabling/disabling of scaling factor α impact PDCCH monitoring.  The motivation for the enabling/disabling is to increase the available BD/CCE on the PCell/PSCell once the sSCell is deactivated or is turned to dormancy. However, as mentioned in the two first level bullets, the consequence of ‘disabling scaling factor α’ is ‘scaling factor is not applied for PDCCH overbooking/BD/CCE limit computation’.  In the other words, the consequence of enabling/disabling scaling factor is change the cap of BD/CCE on the Pcell/PSCell. But the configuration of search space on the Pcell is not changed. In the other words, if we want to achieve a target that more BD/CCE can be used for PDCCH monitoring on the Pcell when SCell is deactivated, the USS configuration on the Pcell should be large. That is, the configured USS on the Pcell can is available only if scaling factor is disabled. Otherwise, there is no point of enabling/disabling. |
| Nokia, NSB | Support. UE feature can be discussed separately, although we would see this as an important piece of the feature and would prefer it to be part of the baseline functionality |
| Ericsson2 | Support the proposal. |
| Moderator Notes3 |  |

**Proposal 6-1v3**

* ~~When UE is~~ For a UE configured for CCS from sSCell to P(S)Cell, scaling factor is not applied for PDCCH overbooking/BD/CCE limit computation when sSCell is deactivated; otherwise scaling factor is applied
  + Timing for disabling scaling factor follows sSCell deactivation timing in current specifications
  + Introduce separate FG to indicate UE support for disabling scaling factor when sSCell is deactivated
* ~~When UE is~~ For a UE configured for CCS from sSCell to P(S)Cell, scaling factor is not applied for PDCCH overbooking/BD/CCE limit computation when sSCell is switched to dormant BWP; otherwise scaling factor is applied
  + Timing for disabling scaling factor follows the non-dormant to dormant BWP switching delay in current specifications
  + Introduce separate FG to indicate UE support for disabling scaling factor when sSCell is switched to dormant BWP

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| **Company Name** | **Support/Not Support** | **Comments (Proposal 6-1v3)** |
| Moderator notes3 |  | Updated to v3 attempting to reflect company inputs.  @Intel – the proposed FG is to “indicate UE support for disabling scaling factor when sSCell is deactivated” (same for BWP). This does not require separate FG for sSCell deactivation/dormancy.  @Qualcomm, MTK, Spreadtrum – Updated to reflect that is not applied for PDCCH overbooking/BD/CCE limit computation when sSCell is deactivated; otherwise, it is applied.  @Xiaomi –Intention of this proposal is to apply/not the scaling factor. Potential changes to SS configuration are being discussed in 6-2. While they can be linked, company views (at least of supporting companies) seem to be that enable/disable scaling factor can also provide benefit individually.  @all – there different views on UE capability but from the comments it appears difficult to agree without introducing separate FGs for this. So, I continue to include in v3. |
| Intel | Support | Thanks for clarification from moderator. We support the proposal. |
| MTK |  | We are generally fine but wondering if the SCell deactivation is finished earlier than the spec requirement (in the UE side), should UE also disable the scaling factor α earlier? Or there is a hard time instance (spec SCell deactivation time length) that UE disables the scaling factor α? |
| Qualcomm |  | Now a bit confused with the wording for the timeline. Maybe similar question as MTK.   * Does “Timing for disabling scaling factor follows sSCell deactivation timing in current specifications” mean that the UE shall disable it at the timing when it deactivates the sSCell? Or, the UE shall disable it no later than the minimum requirement for sSCell deactivation delay according to 38.133/38.213? * Does “Timing for disabling scaling factor follows the non-dormant to dormant BWP switching delay in current specifications” mean that the UE shall disable it at the timing when it deactivates the sSCell? Or, the UE shall disable it no later than the minimum requirement for sSCell deactivation delay according to 38.133/38.213?   Our understanding is latter for both of the above. Perhaps, explicitly describing the timeline (like Proposal 6-1) is clearer.  For the case of sSCell activation/non-dormant cases, we would be more comfortable with the following changes.   * For sSCell deactivation bullet: “~~otherwise~~ when the sSCell is active, scaling factor is applied” * For sSCell dormant BWP bullet: “~~otherwise~~ when the sSCell BWP is non-dormant, scaling factor is applied”   Again, our understanding is that there is no timeline requirement for sSCell activation/non-dormant BWP.  Regarding the FG sub-bullets, yes, we need them. Thanks for addressing our concern. |
| Huawei, HiSilicon3 |  | Ok with Qualcomm clarification. |
| Samsung3 |  | We still don’t think a separate FG is needed, but OK for progress.  From gNB perspective for BD/CCE allocation, the timeline captured in RAN1/4 requirements are considered, but this is already clear from the proposal from FL – no change is needed.  Regarding QC’s statement “*our understanding is that there is no timeline requirement for sSCell activation/non-dormant BWP*”, not sure about intention – TS 38.213 captures the following: 4.3 Timing for secondary cell activation / deactivation 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:  - the actions related to CSI reporting on a serving cell that is active in slot  - the actions related to the *sCellDeactivationTimer* associated with the secondary cell [11, TS 38.321] that the UE applies in slot  - the actions related to CSI reporting on a serving cell which is not active in slot that the UE applies in the earliest slot after  in which the serving cell is active.  The value of  is where slot *n*+*m* is a slot indicated for PUCCH transmission with HARQ-ACK information for the PDSCH reception as described in clause 9.2.3 and  is a number of slots per subframe for the SCS configuration  of the PUCCH transmission as defined in [4, TS 38.211]. |
| CMCC |  | We are fine with the proposal. |
| vivo |  | We support the proposal |
| Xiaomi |  | Thanks for the clarification. We are fine with the updated version from Qualcomm. |
| Spreadtrum |  | In our understanding, the timing for disabling scaling factor α is not clear. We suggest that it can be clarified which of the following alternatives is used here:   * Alt1: UE shall disable it at the timing when sSCell is deactivated according to 38.213, i.e., slot * Alt2: UE shall disable it no later than the minimum requirement defined in TS 38.133 * Alt3: UE shall disable it no later than the minimum requirement defined in TS 38.133 (clause 8.3.2) and no earlier than slot   We prefer Alt3 to reuse existing timeline in RAN1/4.  Regarding MTK’s question, we think SCell deactivation is finished no earlier than the specification requires (in the UE side), then the UE cannot disable the scaling factor α earlier because the behavior of the UE and gNB needs to be consistent. |
| Nokia, NSB |  | We support the proposal. OK with the Qualcomm clarification. |
| Ericsson3 |  | Support the proposal.  Regarding Qualcomm clarification, our understanding is that if no agreement/change is made, alpha is always applied. What needs to be specified is when would alpha be disabled, and this is done when SCell is deactivated.  Regarding Qualcomm question on minimum requirement, we are OK to clarify the timing in the proposal explicitly (as shown below).   * + Timing for disabling scaling factor follows sSCell deactivation timing in current specifications, *i.e. the UE shall disable alpha no later than the minimum requirement for sSCell deactivation delay according to 38.133/38.213.* |

**Proposal 6-1v4**

* For a UE configured for CCS from sSCell to P(S)Cell, scaling factor is not applied for PDCCH overbooking/BD/CCE limit computation when sSCell is deactivated, or when an activated sSCell is switched to dormant BWP; otherwise scaling factor is applied
  + Timing for disabling scaling factor when sSCell is deactivated follows sSCell deactivation timing in current specifications, i.e., no later than the minimum requirement defined in TS 38.133 as captured in 38.213 subclause 4.3
  + Timing for disabling scaling factor follows the non-dormant to dormant BWP switching delay in current specifications ( TS 38.133).
  + Introduce separate FG to indicate UE support for disabling scaling factor when sSCell is deactivated
  + Introduce separate FG to indicate UE support for disabling scaling factor when activated sSCell is switched to dormant BWP

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

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| **Company Name** | **Support/Not Support** | **Comments (Proposal 6-1v4)** |
| Moderator notes4 |  | Updated to v4 attempting to reflect company inputs for v3. |
| Intel | Y |  |
| Qualcomm |  | Our question was, when the sSCell is being activated (not yet completed), whether there is any requirement of “until when” the UE has to keep disabling the scaling factor .  We would like to confirm that, during the sSCell activation procedure, the UE can enable the scaling factor  anytime. In other words, the UE is not required to keep disabling the scaling factor  until the exact timing that sSCell activation is completed.  Other than this clarification on the sSCell activation procedure, we do not have an issue on the current Proposal 6-1v4. |
| MTK |  | Similar concern as QC. In another way, would it be possible to add:   * It is up to UE implementation whether to apply the scaling factor α during sSCell activation/deactivation and during sSCell dormant/non-dormant BWP switch   for clarification? |
| Spreadtrum |  | We support the proposal. OK with Qualcomm clarification. |
| Samsung |  | We are fine to have the exact timing for disabling/enabling the scaling factor α up to UE implementation, as long as they are within the timeline of RAN1/4 requirements. |
| Ericsson4 | Support | Regarding QC comment, our understanding is that the UE is only required to disable scaling factor alpha when SCell is deactivated and scheduling should take this into account. |
| Xiaomi |  | We agree with Qualcomm and MTK that we need to clarify how to enable the scaling factor on for a to-be-activated sSCell. Clarification from Qualcomm is fine to us. |

### Proposal 6-1v5

* For a UE configured for CCS from sSCell to P(S)Cell, scaling factor is not applied for PDCCH overbooking/BD/CCE limit computation when sSCell is deactivated, or when an activated sSCell is switched to dormant BWP; otherwise scaling factor is applied
  + Timing for disabling scaling factor when sSCell is deactivated follows sSCell deactivation timing in current specifications, i.e., no later than the minimum requirement defined in TS 38.133 as captured in 38.213 subclause 4.3
  + Timing for disabling scaling factor follows the non-dormant to dormant BWP switching delay in current specifications ( TS 38.133).
  + Introduce separate FG to indicate UE support for disabling scaling factor when sSCell is deactivated
  + Introduce separate FG to indicate UE support for disabling scaling factor when activated sSCell is switched to dormant BWP
  + Note: It is up to UE implementation whether to apply the scaling factor α during sSCell activation/~~deactivation~~ and during sSCell dormant/non-dormant BWP switch

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

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| **Company Name** | **Support/Not Support** | **Comments (Proposal 6-1v5)** |
| Moderator notes5 |  | Updated to 6-1v5 by adding a Note based on text proposed by MTK. Since sSCell deactivation is already covered by first sub-bullet perhaps no need to repeat again in the Note.  Hopefully this update addresses comments from Qualcomm, MTK, Spreadtrum, Samsung, Xiaomi. |
| ZTE |  | OK with the proposal |
| OPPO |  | The note does not seem to address the timing thing (i.e., when starts to apply and not to apply). So maybe the Note can be modified a bit as following.   * + Note: It is up to UE implementation whether/when to apply the scaling factor α during sSCell activation/deactivation and during sSCell dormant/non-dormant BWP switch   We wonder why “deactivation” should be removed from the note, given the main bullet talks about both “is applied” and “is not applied”. There seems no harm to include it. |
| vivo |  | OK with the proposal |
| MTK |  | We are fine with the proposal and OPPO’s proposed wording revision seems good to us. |

**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

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| **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. |
| Ericsson1 | OK in principle. If UE capability is introduced, prefer to also have associated RRC configuration. Regarding timing details, further clarification is needed, e.g., we prefer to not include Pswitch. |
| OPPO | We do not think it to be necessary to support additional SS configuration for Pcell in case they are monitored on Pcell when sSCell is deactivated/dormant and in case they are not monitored on P(S)Cell when sSCell is activated/non-dormant. In most case, sSCell is deactivated or switching to dormant when there is no large scheduling load. The SS configured on Pcell can maintain the system work by self-scheduling. In other way, search space group switching can also activate some SS if needed. |

### Proposal 6-2v2

* UE monitors ‘additional SS set(s)’ on P(S)Cell when sSCell is deactivated
  + The Timing for monitoring additional SS sets follows sSCell deactivation timing in current specifications
  + Introduce RRC configuration to indicate the *searchSpaceId(s)* of the ‘additional SS set(s)’ that are monitored on P(S)Cell only when sSCell is deactivated
  + Introduce separate FG to indicate UE support for monitoring ‘additional SS set(s)’ on P(S)Cell when sSCell is deactivated
* UE monitors ‘additional SS set(s)’ on P(S)Scell when sSCell is switched to dormant BWP
  + Timing for monitoring additional SS sets follows follows the non-dormant to dormant BWP switching delay in current specifications
  + Introduce RRC configuration to indicate the *searchSpaceId(s)* of the ‘additional SS set(s)’ that are monitored on P(S)Cell only when sSCell is switched to dormant BWP
  + Introduce separate FG to indicate UE support for monitoring ‘additional SS set(s)’ on P(S)Cell when sSCell is switched to dormant BWP

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

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| **Company Name** | **Comments (Proposal 6-2v2)** |
| Moderator notes2 | Updated to v2 based on company inputs.  @Intel, MTK, vivo – Same comment as above. If timing can be determined in RAN1 there is no need for RAN4 input? Note – there are no RAN4 Tus for the WI and extra work to RAN4 should be avoided. |
| Intel | We generally support the proposal.  We prefer to reuse existing mechanism to handle fallback USS sets when sSCell is (de)activated. The second sub-bullet under each main bullet in 6-2v2 sounds a new enabling/disabling method. We share a view from Samsung that the potential existing method can be used here includes search space set overbooking/dropping, and search space set group (SSSG) switching. If overbooking/dropping is used, there may not be a specification impact except setting . If SSSG switching is used, the change is the linking between two SSSGs with the (de)activation/dormancy states. |
| LG Electronics | Support |
| Qualcomm | This ‘additional SS set(s)’ monitoring is similar to SSSG switching. Therefore, we consider the following two are necessary:   1. Separate FG than disabling scaling factor  (already addressed in the proposal 6-2v2) 2. Extra processing time for enabling ‘additional SS set(s)’ monitoring should be allowed. As for the extra processing time, at least the minimum processing time for SSSG switching, *Pswitch* symbols, would be necessary.    * Reason: The UE would need to trigger processing for enabling ‘additional SS set(s)’ monitoring after the sSCell deactivation (or switch to dormant BWP) is completed.   With the above point 2, we suggest to update the proposal as follows. We also propose to make this a working assumption in this meeting, so that companies can check whether the processing time necessary for enabling monitoring the additional SS set(s) below is acceptable.   * UE monitors ‘additional SS set(s)’ on P(S)Cell when sSCell is deactivated   + The Timing for monitoring additional SS sets is no later than *Pswitch* symbols with respect to P(S)Cell SCS configuration after the ~~follows~~ sSCell deactivation is completed according to the ~~timing in~~ current specifications   + Introduce RRC configuration to indicate the *searchSpaceId(s)* of the ‘additional SS set(s)’ that are monitored on P(S)Cell only when sSCell is deactivated   + Introduce separate FG to indicate UE support for monitoring ‘additional SS set(s)’ on P(S)Cell when sSCell is deactivated * UE monitors ‘additional SS set(s)’ on P(S)Scell when sSCell is switched to dormant BWP   + Timing for monitoring additional SS sets is no later than *Pswitch* symbols with respect to P(S)Cell SCS configuration after ~~follows follows~~ the non-dormant to dormant BWP switching is completed according to the ~~delay in~~ current specifications   + Introduce RRC configuration to indicate the *searchSpaceId(s)* of the ‘additional SS set(s)’ that are monitored on P(S)Cell only when sSCell is switched to dormant BWP   + Introduce separate FG to indicate UE support for monitoring ‘additional SS set(s)’ on P(S)Cell when sSCell is switched to dormant BWP   For sSCell activation/non-dormant BWP, we have the same question as to Proposal 6-1v2: the proposal does not include the cases where the sSCell is being activated or sSCell BWP is switched to non-dormant BWP. Does this mean that there is no specific requirement on when to enable the scaling factor ? We are fine with this but would like to confirm. |
| Samsung | Not needed. No reason to re-design what is already supported in NR.  Proposal 6-1v2 already enables increased BD/CCE limit on the P(S)Cell by disabling the scaling factor . Therefore, gNB can configure the ‘additional SS set(s)’ as overbooked SS set(s) that are dropped during DSS operation (with scaling), but monitored during sSCell deactivation or dormancy (without scaling).  Alternatively, the ‘additional SS set(s)’ can be configured as a second SSSG, and the gNB can indicate SSSG switching upon sSCell deactivation/dormancy.  That said, sSCell deactivation is not expected to be a frequent event, so even RRC re-configuration can be sufficient. Also, when sSCell deactivation happens, that probably means that the UE’s buffer at the gNB is (nearly) empty, so it would be detrimental for the UE to be configured to switch to a more aggressive PDCCH monitoring on the Pcell. |
| MTK | We kind of share Samsung’s view. We do not oppose current proposal, but would be curious on the achievable benefits compared to overbooking and SSSG in current spec as mentioned by Samsung. |
| Spreadtrum | We support the proposal.  Same comments for timing of disable the ‘additional SS set(s)’. |
| Huawei, HiSilicon | Support to specify ‘additional SS set(s)’. |
| Xiaomi | Agree with Samsung. With proposal 6-1v2 and proper configuration of USS on Pcell/PSCell, this proposal is not needed. |
| Nokia, NSB | We would be supportive of the proposal. However, the Samsung approach with overbooking with alpha parameter could do the job. |
| Moderator Notes3 | Please continue discussion using current Table. |
| Intel | It seems companies have different view on the second sub-bullet   * + Introduce RRC configuration to indicate the *searchSpaceId(s)* of the ‘additional SS set(s)’ that are monitored on P(S)Cell only when sSCell is deactivated   The general question is what the RRC configuration is? Specifically, is it achieved by reusing certain existing scheme, e.g., overbooking or SSSG switching, or different a new set of SS sets that are dedicated in case sSCell deactivation/dormancy? We would prefer to reuse existing solutions. If large performance benefit can be justified for dedicated SS sets, we are open to it. |
| Huawei, HiSilicon3 | We continue support the intention. |
| CMCC | Considering the second sub-bullet, if using RRC configuration to indicate the *searchSpaceId(s)* of the ‘additional SS set(s)’, additional USS sets for monitoring when sSCell is deactivated/dormant (CCS is disabled) should be pre-configured on P(S)Cell. We think cross-carrier scheduling configuration can be configured per USS set for P(S)Cell, e.g., the information about whether this USS set is used for self-scheduling or used for cross-carrier scheduling when sSCell is activated/non-dormant but can also be monitored on P(S)Cell only when sSCell is deactivated/dormant. |
| Vivo | We support the proposal.  @Samsung: We don’t think current SSSG switching could serve the purpose. In SSSG switching case, current overbooking/SS dropping is done per BWP, not per SSSG. Therefore, SSSG switching will not trigger another overbooking procedure to utilize the updated alpha value.  Agree that RRC re-configuration of search spaces is OK. However, it will introduce more delay. The motivation of this proposal is to avoid RRC re-configuration. |
| Moderator notes4 | Please continue discussion using current Table. |
| Intel | By observing the discussions, we understood essentially 3 options are proposed  Option 1: relying on PDCCH overbooking on P(S)Cell  Option 2: relying on SSSG switching   * It was challenged that existing overbooking/SS dropping is done per BWP, not per SSSG   Option 3: dedicated configured extra USS sets on P(S)Cell which is only used in case sSCell deactivation or dormancy   * If sSCell is activated or non-dormant, BD/CCE of the extra USS sets are not counted towards the maximum BD/CCE budget on P(S)Cell   In our view, Option 3 is effectively SSSG switching with overbooking/SS dropping defined per SSSG. Since SSSG switching is defined in other WI, it may not be desirable to change its behavior in DSS WI. With the observation, it seems Option 1 is preferrable for its least specification impact.   * when sSCell is activated or non-dormant, i.e., a small alpha value appies, some extra configured USS sets for self-scheduling on P(S)Cell are just dropped * when sSCell is deactivated or dormant, i.e., alpha value 1 effectively applies, all extra configured USS sets for self-scheduling on P(S)Cell may become applicable. |
| Qualcomm | Again, we are flexible with the proposal as long as (1) separate FGs are defined, and (2) additional delay, *Pswitch*, is allowed. Relying on PDCCH overbooking on P(S)Cell would not be such easy, considering the fact that scaling factor  is a fixed value while # of BDs/CCEs changes slot-by-slot. |
| MTK | We are still kind of wondering the achievable benefits compared to overbooking and SSSG in current spec, but we can be open to the proposal if majority of companies desire this enhancement. |
| Samsung | Do not support.  Switching the sSCell to deactivated or dormant is somewhat similar to switching off the P(S)Cell for UE-specific scheduling. No need for any optimizations at that case – usual RRC (re)configuration for USS sets is enough, if at all needed.  Also, the gNB can use PDCCH overbooking/dropping to enable ‘additional search space sets’, if it chooses to do so. The BD/CCE limits do not change per slot, and the actual # BDs/CCEs is up to gNB configuration of search space sets. |
| ZTE | We are open to consider this proposal. |
| OPPO | We do not see the sufficient benefit and motivation. This WI is for the case where the P(S)Cell needs scheduling help from sSCell due to crowed PDCCH in P(S)Cell; however, this discussion targets to make P(S)Cell to run well (subject to traffic volume of the UE) like without sSCell by growing SS in P(S)Cell. We do not think the traffic size on P(S)Cell can vary in such a rapid time scale that RRC reconfiguration lags behind badly, otherwise sSCell should not be put into dormant. On the other hand, in case the targeted enhancement is indeed desirable, we prefer to pick existing solution first without new RRC impacts. |
| vivo | We are OK for this proposal.  A typical desirable case for sScell scheduling Pcell:  When sScell is active/non-dormant, UE monitors SSs in Pcell with fallback DCI only; When sScell is deactivated/dormant, UE monitors SSs in Pcell with fallback DCI and non-fallback DCI.  For SSSG switching, as we discussed above, it can’t achieve this purpose since BD/CCE budget is defined per BWP.  For overbooking, agree with QC, SS dropping is done slot by slot so that it is hard for gNB to control that the SSs with non-fallback DCI are dropped in each slot.  For RRC re-configuration, it can achieve this but may cause large delay.  Based on Proposal 6-2v2, gNB could pre-configure SSs with non-fallback USS that are only active when sScell becomes deactivated/dormant. |

### 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. |
| Ericsson1 | Support Alt 2. |
| OPPO | Support Alt 1. In Alt 1, Scell dormancy can be indicated no matter sSCell is activated or de-activated. |
| Moderator Notes2 | Please continue discussion using current Table. |
| Samsung2 | Continue to Support Alt-1.   * There is no good reason why the specs should mandate that specific DCI format x\_1 cannot be monitored in USS sets on the Pcell for Type-A Ues. Such restriction does not provide any simplification for Type-A Ues. * There are various other methods for gNB to enable UE power saving, such as BWP switching, SSSG switching, PDCCH skipping, and so on. |
| NTT DOCOMO | Support Alt 1. |
| Huawei, HiSilicon | Support Alt 2.  Alt 2 is suitable for scenarios where USS is not configured on Pcell. |
| Moderator Notes3 | Please continue discussion using current Table. |
| Xiaomi | Agree with Samsung that there are various methods for UE power saving. Furthermore, SCell dormancy indication can also be carried by DCI format 2\_6. Even there is no DCI format x\_1 configured on PCell, SCell dormancy can be indicated by DCI format 2\_6 if necessary. |
| Moderator notes4 | Please continue discussion using current Table. |
|  |  |

**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 |
| Ericsson1 | OK |
| Lenovo | OK |
| OPPO | OK |
| Moderator Notes2 | Proposal seems to be stable |
| Moderator Notes5 | Agreed on [108-e-NR-DSS-01] email thread  **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 |

**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. |
| Ericsson1 | OK to clarify in the spec. |
| Moderator Notes2 | Please continue further discussion using current table especially on exact TP text to agree. |
| Samsung2 | OK with the revised TP from LGE.  Thanks to Intel for the further clarification. Based on UE feature discussions, the identified situation cannot happen for FDD Pcell since the UE monitors only one DCI in each Pcell slot and the aligned sSCell slots (1D1U). But, we can see the issue for the case of (1D2U). In that sense, we are fine with the revised TP from LGE. (The original TP from Intel is ambiguous). |
| ZTE | It seems the TP itself doesn’t reflect that the scheduling can happen in two cells. How about the following.  *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 on the same or different scheduling cell that ends later than the end of symbol I.* |
| Ericsson2 | Agree with Intel comment about the TP in Proposal 4 of R1-2202163.  ZTE proposed version seems more accurate to us. |
| Moderator Notes3 | Please continue further discussion to converge based on below TP options   1. TP1 in Proposal 7 of R1-2201720 2. TP in Proposal 4 of R1-2202163 3. Updated TP suggested by LGE 4. Updated TP suggested by ZTE |
| Intel | We support a TP that refers to the scheduling cell. So, we can accept 1), 3) or 4) in general.  Since the term ‘*the end of symbol i’* is not used in existing specification, we slightly prefer either TP1 in Proposal 7 of R1-2201720 or Updated TP suggested by LGE |
| MTK | We prefer updated TP suggested by ZTE. It seems more accurate. |
| Qualcomm | In terms of accuracy, we think all of them are accurate and no problem with them. TPs other than ZTE’s also take into account that scheduling can happen in the two scheduling cells. If companies want to use the scheduling cell symbol index as the reference, perhaps we can go with the simplest TP, 3) by LGE. |
| Samsung3 | The TP from ZTE may be more confusing than clarifying, so we continue to think the TP 3) from LGE is good enough. The phrase “a scheduling cell … the scheduling cell” is sufficient to capture the intention and can refer to same or different scheduling cell(s). |
| vivo | We are fine with 1), 3) and 4). All of them have same meaning. Based on this, we prefer the simplest TP, i.e. 3) . |
| Xiaomi | Prefer LGE’s version. |
| Spreadtrum | We prefer referring scheduling cell to define symbol *i*. Option 1), 3) or 4) are fine to us. |
| Nokia, NSB | Prefer the LGE version |
| Ericsson3 | Prefer to clarify that PDCCH can be on any cell (PCell/sSCell) to avoid future confusion, but OK to go with majority. |

### Proposal TP-1v2

* Agree to below TP for 38.214 sub clause 5.1 and 6.1.

|  |
| --- |
| \*\*\* 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 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 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 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 scheduling cell.  \*\*\* Unchanged text is omitted \*\*\* |

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

|  |  |  |
| --- | --- | --- |
| **Company Name** | **Support/Not Support** | **Comments (Proposal TP1v2)** |
| Moderator notes4 |  | Updated to TP1v2 reflecting comments received for Discussion Point TP-1. The Proposal from LGE seems to be OK with most companies. |
| Intel | Y |  |
| LG Electronics | Support |  |
| Qualcomm |  | We are OK with the proposal. |
| MTK |  | We still prefer ZTE’s version but would also be fine with the moderator proposal. |
| Spreadtrum |  | We support the proposal. |
| Samsung |  | OK with the proposal |
| Ericsson4 |  | OK with the proposal |
| Moderator notes5 |  | Proposal seems to be stable. |
| ZTE |  | Although we prefer our previous version of TP, we can live with this. |
| vivo |  | OK with the proposal |
| MTK |  | We can be fine with current proposal. |

### 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. |
| Ericsson1 | OK to discuss. NCI =0 should be used for PCell self-scheduling. If this is not already clear, open to clarify in spec. |
| OPPO | share the view from Samsung. No need to have this TP. |
| Moderator Notes2 | Please continue further discussion using current table. |

### 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. |
| Ericsson1 | In principle OK, but TP may need to be refined. |
| OPPO | Fine with the TP. According to the previous agreement, there is no overbooking on sSCell. The PDCCH candidate allocation procedure is mainly used for CSS and USS configured on PCell. The clarification is needed. |
| Moderator Notes2 | Please continue further discussion using current Table. @Qualcomm, Nokia, Ericsson – can you please indicate your preferred changes to MTK proposal |
| Samsung2 | TP is not needed, since (i) the current spec clearly mentions that overbooking applies only to search space sets for PCell self-scheduling, and (i) already captures the update of the BD/CCE limits for overbooking/dropping based on the scaling factor.  Can proponent(s) clarify what aspect is missing?  For allocation of PDCCH candidates and non-overlapping CCEs to search space sets for scheduling on the primary cell from the primary cell, the UE applies the procedure in clause 10.1 using instead of , and using instead of for the primary cell. |
| MTK | Thanks Samsung2 for copying the spec for our reference. With the blue highlighted text by Samsung2, then we think only the remaining text from 38.213 10.1 describing  from is still a little confusing:   * Denote by , , the number of counted PDCCH candidates for monitoring for CSS set  and by , , the number of counted PDCCH candidates for monitoring for USS set .   However, if most companies think is already only considering PDCCH candidates for monitoring for USS set on P(S)Cell for same cell scheduling **according to current spec**, then we think we can leave the spec as it currently is. |
| Moderator Notes3 | Please continue further discussion (if needed) using current table. |
| Intel | We understand MTK’s concern on . It may be helpful for reading to clarify is that on PCell. We are open for discussion. |
| Nokia, NSB | The key problem we see is that the reference to “overbooking” and “overbooking procedure” does not refer defined procedure or action. One has to know that overbooking is the unnamed procedure for allocating PDCCH candidates in the very same subclause where we are making the proposed reference. As commented, we are OK to make this clarification, but are not exactly a proponent. The best way would be to generate substructure to clause 10.1 and have subheadings, with one of them “overbooking”, and then you could refer to that subclause, as 10.1 is already in Rel-15 10 pages with no sub-structure making it less reader-friendly than it could be. If such an approach would be OK to the editor, that’d be our suggestion. |
| Moderator notes4 | Please continue further discussion using current table. |
| MTK | We support Nokia’s suggestion and we are flexible on the wording and structure to reference “overbooking” more directly. |

**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 |
| Ericsson1 | Support the TP. As explained in our contribution, without the change, the BD/CCE budget is unnecessarily reduced with current formulation, and TP avoids this unnecessary loss. About Intel comment, the condition mentioned by Intel does not always apply e.g., when alpha<1 |
| OPPO | We are fine with the TP |
| Moderator Notes2 | Please continue any further discussion using current Table. @Samsung – is it OK to agree to TP considering the discussion and clarifications? |
| Intel | Sorry for a typo, I mean = . It should give the same value with shortened formula |
| Samsung2 | We think the text is already clear, but OK to proceed in view of the majority opinion. |
| ZTE | Ok with the TP |
| Moderator Notes3 | TP of Annex A of R1-2202221 seems to be stable. |

**Proposal TP-4v2**

* Agree to TP in Annex A of R1-2202221

|  |  |
| --- | --- |
| **Company Name** | **Comments (Proposal TP-4v2)** |
| Moderator notes4 | Proposal based on Discussion point TP-4 already shared on reflector and seems to be stable. |
| Moderator notes5 | Agreed on [108-e-NR-DSS-01] email thread  **Agreement**   * The following TP to Section 10.1.1 of TS38.214(Identical to the TP in Annex A of R1-2202221) is endorsed. |

### 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