**3GPP TSG RAN WG1 #108-e R1-2nnnnn**

**e-Meeting,** **February 21st – March 3rd, 2022**

**Agenda Item: 8.16.13**

**Source: Moderator (AT&T)**

**Title: Summary of UE features for DSS**

**Document for:** **Discussion/Decision**

# Introduction

This document presents the summary of email discussion/approval [108-e-R17-UE-features-DSS-01] during RAN1 #108-e. According to the Chairman’s Notes:

|  |
| --- |
| [108-e-R17-UE-features-DSS-01] Email discussion on UE features for DSS – Ralf (AT&T)* 1st check point: February 25
* Final check point: March 3
 |

The following was discussed and/or agreed during RAN1 #108-e within the scope of [108-e-R17-UE-features-DSS-01]. All proposals are based on the latest RAN1 UE features list for Rel-17 NR in [1].

# Summary of Contributions Submitted to RAN1 #108-e

The following is the moderator’s summary of contributions submitted to RAN1 #108-e in this agenda item.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  34. NR\_DSS | 34-2 | Cross-carrier scheduling from SCell to PCell/PSCell (Type B) | [Support of Cross-carrier scheduling (CCS) from sSCell to PCell/PSCell (Type B)]1. Cross-carrier scheduling from sSCell to PCell/PSCell with CIF
2. sSCell USS set(s) (for CCS from sSCell to PCell/PSCell) and search space sets on PCell/PSCell can be configured so that the UE monitors them in overlapping [slot/symbol] of PCell/PSCell and sSCell
3. Configuration of scaling factor α for BD and CCE limit handling and PDCCH overbooking handling on P(S)Cell
4. FFS: #unicast DCI limits for PCell/PSCell scheduling
* Processing one unicast DCI scheduling DL on PCell/PSCell per PCell/PSCell slot and its aligned N consecutive sSCell slot(s)
* Processing one unicast DCI scheduling UL on PCell/PSCell per PCell/PSCell slot and its aligned N consecutive sSCell slot(s)
* N is based on pair of (PCell/PSCell SCS, sSCell SCS): N=1 for(15,15), (30,30), (60,60) and N=2 for (15,30), (30,60) and N=4 for (15, 60)
1. Same numerology between sSCell and P(S)Cell or sSCell SCS is larger than P(S)Cell SCS
2. FFS: USS set(s) for DCI format 0\_1,1\_1,0\_2,1\_2 configured on sSCell for CCS from sSCell to PCell/PSCell
3. FFS: Support of sSCell deactivation/activation when sSCell cross carrier scheduling to PCell/PSCell is configured
4. FFS: Support of sSCell dormancy when sSCell cross carrier scheduling to PCell/PSCell is configured
5. FFS: PDCCH monitoring occasion(s) is within the first 3 OFDM symbols of a PCell/PSCell slot
6. FFS: Numbers of CORESET configurations and search space sets on sSCell (for PCell/PSCell cross-carrier scheduling)
7. FFS: frame boundary alignment between PCell/PSCell and sSCell
8. FFS: Precoder granularity of REG-bundle size when CCS from sSCell to PCell/PSCell is configured

Note: The SCell configured with Cross-carrier scheduling to PCell/PSCell is referred to as ‘sSCell’ | 6-5 [, 34-1] | Yes |  |  | Per BC | No | Applicable to FR1 only |  | [Candidate value set 1: One or more of supported SCS combinations ({P(S)Cell SCS in kHz, sSCell SCS in kHz}) from following set are indicated by the UE: {15,15}, {15,30}, (15, 60) for N=4, {30,30}, {30,60},{60,60})Candidate value set 2: frequency band pair(s) for {PCell/PSCell, sSCell}]Note: The CCS from sSCell to Pcell is applicable to FR1 only but there can be other Scells in FR2 configured for the UE | Optional with capability signalling |

|  |  |
| --- | --- |
| Company | Summary |
| Huawei/HiSilicon [2] | Regarding the component bullet 7 for FG 34-2:* FFS: USS set(s) for DCI format 0\_1,1\_1,0\_2,1\_2 configured on sSCell for CCS from sSCell to PCell/PSCell

If a UE supports cross-carrier scheduling from SCell to PCell/PSCell, it should supports USS set(s) for DCI format 0\_1, 1\_1 configured on sSCell for CCS from sSCell to PCell/PSCell. However, monitoring DCI format 1\_2 and DCI format 0\_2 is introduced in Rel-16, thus a UE can selectively support this feature. ***Proposal: Update bullet 7 for FG 34-2 to be “USS set(s) for DCI format 0\_1,1\_1 configured on sSCell for CCS from sSCell to PCell/PSCell; and USS set(s) for DCI format 0\_2,1\_2 configured on sSCell for CCS from sSCell to PCell/PSCell if UE supports FG 11-1 (dci-Format1-2And0-2-r16)”.***Regarding the component bullet 10 for FG 34-2:* FFS: PDCCH monitoring occasion(s) is within the first 3 OFDM symbols of a PCell/PSCell slot

The typical case of PCell SCS 15 kHz and sSCell SCS 30 kHz in DSS is taken as an example. When a UE reports to support USS(s) configured in the symbols other than the first 3 symbols of a slot, the PDCCH monitoring occasion(s) location should not be restricted. Even if a UE reports that it supports USS(s) only configured on the first 3 symbols of a slot, the UE should support USS(s) configured on sSCell within the first 3 symbols of any sSCell slot, instead of within the first 3 symbols of any first sSCell slot of the two sSCell slots overlapping with the PCell slot. Otherwise the efficiency of offloading PDCCH from PCell to sSCell is significantly affected.***Proposal: Remove bullet 10 for FG 34-2.***Regarding the component bullet 13 for FG 34-2:* FFS: Precoder granularity of REG-bundle size when CCS from sSCell to PCell/PSCell is configured

We don’t see the necessary to introduce this component. We propose to remove it.***Proposal: Remove bullet 13 for FG 34-2.***

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  34. NR\_DSS | 34-2 | Cross-carrier scheduling from SCell to PCell/PSCell (Type B) | [Support of Cross-carrier scheduling (CCS) from sSCell to PCell/PSCell (Type B)]1. Cross-carrier scheduling from sSCell to PCell/PSCell with CIF
2. sSCell USS set(s) (for CCS from sSCell to PCell/PSCell) and search space sets on PCell/PSCell can be configured so that the UE monitors them in overlapping [slot/symbol] of PCell/PSCell and sSCell
3. Configuration of scaling factor α for BD and CCE limit handling and PDCCH overbooking handling on P(S)Cell
4. FFS: #unicast DCI limits for PCell/PSCell scheduling
* Processing one unicast DCI scheduling DL on PCell/PSCell per PCell/PSCell slot and its aligned N consecutive sSCell slot(s)
* Processing one unicast DCI scheduling UL on PCell/PSCell per PCell/PSCell slot and its aligned N consecutive sSCell slot(s)
* N is based on pair of (PCell/PSCell SCS, sSCell SCS): N=1 for(15,15), (30,30), (60,60) and N=2 for (15,30), (30,60) and N=4 for (15, 60)
1. Same numerology between sSCell and P(S)Cell or sSCell SCS is larger than P(S)Cell SCS
2. ~~FFS:~~ USS set(s) for DCI format 0\_1,1\_1~~,0\_2,1\_2~~ configured on sSCell for CCS from sSCell to PCell/PSCell; and USS set(s) for DCI format 0\_2,1\_2 configured on sSCell for CCS from sSCell to PCell/PSCell if UE supports FG 11-1 (*dci-Format1-2And0-2-r16*)
3. FFS: Support of sSCell deactivation/activation when sSCell cross carrier scheduling to PCell/PSCell is configured
4. FFS: Support of sSCell dormancy when sSCell cross carrier scheduling to PCell/PSCell is configured
5. ~~FFS: PDCCH monitoring occasion(s) is within the first 3 OFDM symbols of a PCell/PSCell slot~~
6. FFS: Numbers of CORESET configurations and search space sets on sSCell (for PCell/PSCell cross-carrier scheduling)
7. FFS: frame boundary alignment between PCell/PSCell and sSCell
8. ~~FFS: Precoder granularity of REG-bundle size when CCS from sSCell to PCell/PSCell is configured~~

Note: The SCell configured with Cross-carrier scheduling to PCell/PSCell is referred to as ‘sSCell’ | 6-5 [, 34-1] | Yes |  |  | Per BC | No | Applicable to FR1 only |  | [Candidate value set 1: One or more of supported SCS combinations ({P(S)Cell SCS in kHz, sSCell SCS in kHz}) from following set are indicated by the UE: {15,15}, {15,30}, (15, 60) for N=4, {30,30}, {30,60},{60,60})Candidate value set 2: frequency band pair(s) for {PCell/PSCell, sSCell}]Note: The CCS from sSCell to Pcell is applicable to FR1 only but there can be other Scells in FR2 configured for the UE | Optional with capability signalling |

 |
| Vivo [3] | * **The granularity of feature 34-2**

In the last meeting, it was discussed whether the following candidate value sets are needed.[Candidate value set 1: One or more of supported SCS combinations ({P(S)Cell SCS in kHz, sSCell SCS in kHz}) from following set are indicated by the UE: {15,15}, {15,30}, (15, 60) for N=4, {30,30}, {30,60},{60,60})Candidate value set 2: frequency band pair(s) for {PCell/PSCell, sSCell}]BandCombination ::= SEQUENCE { bandList SEQUENCE (SIZE (1..maxSimultaneousBands)) OF BandParameters, featureSetCombination FeatureSetCombinationId, ca-ParametersEUTRA CA-ParametersEUTRA OPTIONAL, ca-ParametersNR CA-ParametersNR OPTIONAL, mrdc-Parameters MRDC-Parameters OPTIONAL, supportedBandwidthCombinationSet BIT STRING (SIZE (1..32)) OPTIONAL, powerClass-v1530 ENUMERATED {pc2} OPTIONAL}This feature is reported per BC. However, a BC may consist of up to 32 bands, UE should not be mandated to support all possible combinations of {PCell/PSCell, sSCell} on the BC considering the practical scenarios for sScell scheduling Pcell/PScell would be very specific and highly demand-driven. Therefore, further details such as which band(s) in the reported BC can be used for PCell/PSCell and which one(s) are for sScell should be provided to avoid overcomplicated implementation. Besides, considering that the supported SCSs for each {PCell/PSCell, sSCell} pair are also specific, it is also necessary to indicate the candidate value set1 to simplify the implementation. Therefore, both candidate value set1 and candidate value set2 should be included in the UE capability. Besides, the incorrect copy-paste text ‘for N=4’ should be deleted.* **De-activation/dormancy of sScell**

It has been discussed whether there is a need to introduce a new capability of dormancy and deactivation of sScell. The necessity of this indication depends on the WI discussion. If new functionality is also introduced when sScell is de-activated or dormant, a new capability is needed. Otherwise, legacy capability can be reused.Based on the previous discussion, we have the following proposal. The updated FG details can be found in the appendix.Proposal. For the UE feature on 34-2, the following aspects should be considered* + **Both candidate value set1 and candidate value set2 should be supported as part of 34-2**
		- **Delete the wrong text ‘for N=4’ in candidate value set1**
	+ **The necessity of a new capability of dormancy and deactivation of sScell is pending on the WI discussion, if new functionality is introduced for dormancy and deactivation of sScell, new capability should be introduced.**
 |
| ZTE [4] | There is another issue related to UE features and the corresponding agreement in RAN1#106b-e meeting is copied below.

|  |
| --- |
| **[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.
 |

The background of above high-lighted yellow part is how to arrange the USS on sSCell for cross-carrier scheduling to PCell. There are three alternatives in the RAN1#106e agreement which are also copied below.

|  |
| --- |
| * 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

* Alt2
	+ The additional BD limitation is per P(S)Cell slot and no further restrictions
* Alt3
	+ 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
 |

For further consideration on whether dividing BD/CCE budget per sSCell slot among sSCell slots overlapped with one PCell slot, Alt1 is slightly preferred with BD/CCE equal split for the sSCell slots overlapping with one P(S)Cell slot. Because this will align with the traditional understanding of BD/CCE budget per slot of each scheduling cell and UE can also determine the scaled BD/CCE budget per slot on scheduling cell for each scheduled cell with clear threshold. Alt2 has some additional flexibility on PDCCH candidate allocation among sSCell slots overlapped with one PCell slot. But Alt3 cannot be acceptable due to unreasonable restriction for USS configuration on sSCell. As shown in Figure 1, the USS configuration on sSCell used for scheduling to PCell is restricted within 3 consecutive OFDM symbols which will significantly impact the efficiency of offloading PDCCH to sSCell.Figure 1 An example of Alt3Now Alt.3 is determined to be discussed as part of UE features discussion, we don’t think such restriction is needed for sSCell scheduling PCell.***Proposal****: The following restriction is NOT needed for sSCell scheduling PCell.*

|  |
| --- |
| * + - 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
 |

 |
| Nokia/Nokia Shanghai Bell [5] | 1. The same components as with Rel-15 cross-carrier scheduling and Rel-16 cross-carrier scheduling with different SCS should be automatically included by corresponding FGs, if supported by the UE, and the ability for the PCell to be the scheduled cell does not impact those functionalities. Hence, this component is redundant and should be removed.
2. The USS set configuration for CCS to PCell must be supported for the feature to make sense, this component can be confirmed
3. The SCell activation/deactivation support is a separate mandatory feature for UEs supporting CA already and the cell’s ability to schedule a particular other cell does not impact this feature. This component can be removed.
4. The SCell dormancy support is a separate optional feature (see FGs 18-4/4a) and the cell’s ability to schedule a particular other cell does not impact this feature. This component can be removed as there are separate FGs for this already.
5. This is a minimum support as defined for Rel-15 UEs. The component is redundant and can be removed.
6. The fact that the scheduled cell is a PCell should not have any impact to this. The component should be removed.
7. This is a basic requirement, could be confirmed or removed as redundant.
8. The precoder granularity support has no relation to whether the cross-carrier scheduled cell with the PDCCH happens to be a PCell. This component should be removed.
 |
| Intel Corporation [6] | * The item 7) can be included as one aspect of 34-2.
* The item 8), 9) may be defined as separate FGs, since the basic feature CCS from sSCell to P(S)Cell works without support of sSCell dormancy/deactivation.
* The item 10) is not necessary since the search space configurations monitored on sSCell for cross-carrier scheduling to P(S)Cell may be in a span that is not the first 3 OFDM symbols of a P(S)Cell slot
* Regarding item 12), we prefer to differnet a separate FG for unaligned CA, since the basic feature CCS from sSCell to P(S)Cell works without support of unaligned CA.
* It is not clear why item 13) is necessary

**Proposal:** For FG 34-2, it is proposed that* The item 7) can be included as one aspect of 34-2.
* The item 8), 9), 12) may be defined as separate FGs
* The item 10), 13) are not necessary
 |
| Apple [7] |  |
| CMCC [8] | For Type B UE, non-fallback DCI format configured on sSCell for CCS from sSCell to PCell/PSCell is supported, then the component 7) listed in FG 34-2 can be updated by removing “FFS”.**Proposal. Update component 7) for FG 34-2 as the following:**1. **~~FFS:~~ USS set(s) for DCI format 0\_1,1\_1,0\_2,1\_2 ~~(if supported)~~ configured on sSCell for CCS from sSCell to PCell/PSCell**

Considering component 12), unaligned CA can also be supported to Type B UE. Similar to the discussion for FG 34-1 above, we propose to update the component 12) of FG34-2 as the following proposal.**Proposal. Remove the component 12) listed in FG 34-2.**1. **~~FFS: frame boundary alignment between PCell/PSCell and sSCell~~**

**Proposal. If one UE reports support FG 18-7 and FG 34-1/FG 34-2, it means its sSCell can be configured with non-zero *ca-SlotOffset*.** |
| Xiaomi [9] | For component 2), as analyzed in the aforementioned section, we think the time granularity should be slot instead of symbol.**Proposal: For component 2) under FG 34-2, UE monitors sSCell USS sets and search space sets on PCell/PSCell in overlapping slot of PCell/PSCell and sSCell.**For component 4), as analyzed in the aforementioned section, we think the PCell/PSCell SCS should focus to 15 kHz.In component 2), it mentions that ‘*sSCell USS set(s) (for CCS from sSCell to PCell/PSCell) and search space sets on PCell/PSCell can be configured*’. For a USS set, it can be configured with DCI format 0\_1, 1\_1, 0\_2 and 1\_2 per the current specification. Hence, component 2) already covers component 7) and component 7) becomes redundant.**Proposal: For FG 34-2, remove component 7).** |
| Samsung [10] | Since all PDCCH monitoring limits are per P(S)Cell slot, determination of an overlap or no-overlap should be with a granularity of P(S)Cell slots. In addition, configuration of non-fallback DCI formats in USS sets on sSCell and all DCI formats including non-fallback DCI formats in USS sets on P(S)Cell should be supported for flexible scheduling on the P(S)Cell, for both Type-A and Type-B UEs. **Proposal:** * **determination of overlap or no-overlap is with a granularity of P(S)Cell slots;**
* **non-fallback DCI formats on sSCell and both fallback and non-fallback DCI formats on P(S)Cell are supported.**

The corresponding component updates of each FG are:For FG 34-2 (Type-B UE)1. sSCell USS set(s) (for CCS from sSCell to PCell/PSCell) and search space sets on PCell/PSCell can be configured so that the UE monitors them in overlapping ~~[~~slot~~/symbol]~~ of PCell/PSCell and sSCell
2. ~~FFS:~~ USS set(s) for DCI format 0\_1,1\_1,0\_2,1\_2 configured on sSCell for CCS from sSCell to PCell/PSCell

According to the following agreement, both Type-A and Type-B UEs apply the same BD limit handling:

|  |
| --- |
| **Agreement (RAN1#107-e)*** + - BD/CCE limits for Type B UEs are applicable for Type A UEs supporting cross-carrier scheduling from sSCell to P(S)Cell
 |

The current UE feature list for DSS captures BD/CCE limit handling only for Type-B UEs based on the scaling factor , and assumes the cell counting parameter (s1=1, s2=0). The same should be reflected for Type-A UEs as well. In addition, in our companion Tdoc for the DSS WI [2], we have proposed modifications to the BD/CCE limit handling based on additional (s1, s2) values and additional scaling factor The UE feature can be updated based on the decision on these parameters.**Proposal: Align BD/CCE limit handling for Type-A and Type-B UEs, and update based on DSS WI decision on additional (s1, s2) parameters and new parameter .**The corresponding component updates of each FG are:For FG 34-2 (Type-B UE)1. Configuration of scaling factor α for BD and CCE limit handling and PDCCH overbooking handling on P(S)Cell

FFS: Configuration of additional (s1, s2) values and/or additional scaling factor NR Rel-15 supports (as part of FG 3-1) processing one unicast DCI scheduling DL and one unicast DCI scheduling UL per slot per scheduled CC for FDD, and one unicast DCI scheduling DL and 2 unicast DCI scheduling UL per slot per scheduled CC for TDD as mandatory UE feature without capability signaling. NR Rel-16, in the framework of cross-carrier scheduling (CCS) from higher SCS to lower SCS, supports (as part of FG 18-5) processing one unicast DCI scheduling DL per N consecutive scheduling CC slot per scheduled CC for FDD scheduling CC, and one unicast DCI scheduling DL per N consecutive scheduling CC slot per scheduled CC for TDD scheduling CC. In addition, FG 18-5b supports processing one unicast DCI scheduling UL per N consecutive scheduling CC slot per scheduled CC for FDD scheduling CC, and 2 unicast DCI scheduling UL per N consecutive scheduling CC slot per scheduled CC for TDD scheduling CC. Herein, N is based on pair of (scheduling CC SCS, scheduled CC SCS): N=2 for (30,15), (60,30), (120,60) and N=4 for (60,5), (120,30), N = 8 for (120,15). For a Type-A UE, since either the P(S)Cell or the sSCell is a scheduling cell for the P(S)Cell in each P(S)Cell slot, the same UE feature as in Rel-15/16 can be maintained.For a Type-B UE, since a DSS UE is intended to have no change to the total PDCCH blind decoding budget compared to a Rel-16 UE, even a Type-B UE is not expected to process more DCI formats than a Rel-15/16 UE. DSS operation enables PDCCH offloading from P(S)Cell to sSCell, so the number of processed DCI for the P(S)Cell can be maintained as in Rel-15/16. **Proposal: For both Type-A and Type-B UEs, the number of processed DCI for the P(S)Cell is maintained as in Rel-15/16 including the case of 2 unicast DCIs scheduling UL per N consecutive scheduling CC slot per scheduled CC for TDD scheduling CC.**The corresponding component update of each FG is:~~FFS:~~ #unicast DCI limits for PCell/PSCell scheduling* Processing one unicast DCI scheduling DL on PCell/PSCell per PCell/PSCell slot and its aligned N consecutive sSCell slot(s)
* Processing ~~one~~K unicast DCI scheduling UL on PCell/PSCell per PCell/PSCell slot and its aligned N consecutive sSCell slot(s)
* N is based on pair of (PCell/PSCell SCS, sSCell SCS): N=1 for(15,15), (30,30), (60,60) and N=2 for (15,30), (30,60) and N=4 for (15, 60)
* K = 1 in case when both PCell/PSCell and sSCell are FDD. Otherwise, K = 2

Support of sSCell deactivation/activation is clear from the following RAN1 agreement. In addition, SCell activation/deactivation is the fundamental functionality in CA operation. This would be the reason why the corresponding UE capability is not defined from Rel-15, i.e., nothing to do with UE capability:

|  |
| --- |
| **Agreement (**RAN1#104-e (Jan/Feb 2021))* When CCS from sSCell to PCell/PSCell is configured, CA activation/deactivation operation for the sSCell is supported
 |

**Proposal: For both Type-A and Type-B UEs, remove ‘Support of sSCell deactivation/activation’ from the component.**The corresponding component update of each FG is:~~FFS: Support of sSCell deactivation/activation when sSCell cross carrier scheduling to PCell/PSCell is configured~~The UE capabilities for SCell dormancy (FG 18-4/18-4a) were defined in Rel-16. In our view, the UE supporting SCell dormancy and sSCell operation respectively should support sSCell dormancy as well. That is, no need to define the combination as a UE capability.**Proposal: For both Type-A and Type-B UEs, remove ‘Support of sSCell dormancy’ from the component.**The corresponding component update of each FG is:~~FFS: Support of sSCell dormancy when sSCell cross carrier scheduling to PCell/PSCell is configured~~The UE feature list for Rel-15/16 [TR 38.822] includes a baseline/mandatory FG 3-1 for PDCCH monitoring, based on which USS sets and certain CSS sets are confined to the first 3 OFDM symbols of a slot. In addition, optional UE features 3-2 and 22-8a support monitoring all search space sets within the same span of 3 consecutive OFDM symbols in the slot. For Rel-17 DSS UEs, same principle as in Rel-15/16 can be followed to confine search space sets on P(S)Cell or on sSCell for scheduling P(S)Cell to the first 3 OFDM symbols of the corresponding scheduling cell. For example, the UE supports monitoring a USS set on P(S)Cell within the first 3 OFDM symbols of P(S)Cell slot, and the UE supports monitoring a USS set on sSCell for scheduling P(S)Cell within the first 3 OFDM symbols of the sSCell slot.The agreement from RAN1#106bis-e leaves the relative configuration (in time domain) of USS sets on the sSCell and USS/CSS sets on the P(S)Cell open, to enable flexible PDCCH offloading from P(S)Cell to sSCell. In particular, for the case of different SCS between P(S)Cell and sSCell, when a slot of P(S)Cell overlaps with multiple slots of sSCell, it is up to gNB configuration how to distribute the USS sets on sSCell for P(S)Cell scheduling among the multiple sSCell slots that overlap with a P(S)Cell slot. Therefore, a baseline UE feature list for DSS should include support for such flexible configuration of search space sets in any sSCell slot overlapping with a P(S)Cell slot. However, it is possible that such flexible distribution of PDCCH candidates among multiple sSCell slots may not be supported by some DSS UE implementations. Accordingly, a separate UE capability can be considered so that the DSS UE can monitor limited locations for USS sets on the sSCell, such as the first [3] OFDM symbols of the P(S)Cell slot or within a single span of [3] consecutive OFDM symbols of a P(S)Cell slot.In principle, the above discussion can apply to both Type-A and Type-B UEs (especially since a same BD/CCE handling is agreed for both Type-A and Type-B UEs). However, since Type-A UE is intended for simplified UE operation, it is reasonable to consider the simplified time-domain configuration as a baseline implementation for Type-A UEs. Therefore, the flexible search space set configuration can be considered only for Type-B UEs.**Proposal: For Type-B UEs, and when P(S)Cell has a smaller SCS configuration than the sSCell, the UE capability should include support of a flexible time-domain configuration of ‘USS sets on sSCell for P(S)Cell scheduling’ in any of the sSCell slots that overlap a same P(S)Cell slot. The PDCCH monitoring occasion(s) is within the first 3 OFDM symbols of the corresponding sSCell slot(s).**The corresponding component updates of each FG are:For FG 34-2 (Type-B UE)10) ~~FFS:~~ PDCCH monitoring occasion(s) is within the first 3 OFDM symbols of a ~~PCell/PSCell~~ slot of a corresponding scheduling cell (PCell/PSCell or sSCell)Similarly, we do not see the need for separate capability for CORESET and search space sets specific for sSCell.**Proposal: For both Type-A and Type-B UEs, remove ‘Numbers of CORESET configurations and search space sets on sSCell (for PCell/PSCell cross-carrier scheduling)’**The corresponding component update of each FG is:~~FFS: Numbers of CORESET configurations and search space sets on sSCell (for PCell/PSCell cross-carrier scheduling)~~RAN1 is pending for decision whether sSCell can also be configured with unaligned frame boundary with P(S)Cell. Regardless, it is good enough to have Rel-16 FG 18-7 (CA with non-aligned frame boundaries) as it is. If RAN1 agrees to not support unaligned frame boundary between P(S)Cell and sSCell, that can be clarified in RAN1 spec not in UE capability.**Proposal: For both Type-A and Type-B UEs, remove ‘Frame boundary alignment between PCell/PSCell and sSCell’**The corresponding component update of each FG is:~~FFS: frame boundary alignment between PCell/PSCell and sSCell~~Again, no reason to define a separate capability beyond already existing one, i.e., Rel-15 FG 3-7 *(precoderGranularityCORESET).***Proposal: For both Type-A and Type-B UEs, remove ‘Precoder granularity of REG-bundle size when CCS from sSCell to PCell/PSCell is configured’.**The corresponding component update of each FG is:~~FFS: Precoder granularity of CORESET size when CCS from sSCell to PCell/PSCell is configured~~

|  |  |  |
| --- | --- | --- |
| 34-2 | Cross-carrier scheduling from SCell to PCell/PSCell (Type B) | [Support of Cross-carrier scheduling (CCS) from sSCell to PCell/PSCell (Type B)]1. Cross-carrier scheduling from sSCell to PCell/PSCell with CIF
2. sSCell USS set(s) (for CCS from sSCell to PCell/PSCell) and search space sets on PCell/PSCell can be configured so that the UE monitors them in overlapping slot of PCell/PSCell and sSCell
3. Configuration of scaling factor α for BD and CCE limit handling and PDCCH overbooking handling on P(S)CellFFS: Configuration of additional (s1, s2) values and/or additional scaling factor
4. #unicast DCI limits for PCell/PSCell scheduling
* Processing one unicast DCI scheduling DL on PCell/PSCell per PCell/PSCell slot and its aligned N consecutive sSCell slot(s)
* Processing K unicast DCI scheduling UL on PCell/PSCell per PCell/PSCell slot and its aligned N consecutive sSCell slot(s)
* N is based on pair of (PCell/PSCell SCS, sSCell SCS): N=1 for(15,15), (30,30), (60,60) and N=2 for (15,30), (30,60) and N=4 for (15, 60)
* K = 1 in case when both PCell/PSCell and sSCell are FDD. Otherwise, K = 2
1. Same numerology between sSCell and P(S)Cell or sSCell SCS is larger than P(S)Cell SCS
2. USS set(s) for DCI format 0\_1,1\_1,0\_2,1\_2 configured on sSCell for CCS from sSCell to PCell/PSCell
3. PDCCH monitoring occasion(s) is within the first 3 OFDM symbols of a slot of a corresponding scheduling cell (PCell/PSCell or sSCell)

Note: The SCell configured with Cross-carrier scheduling to PCell/PSCell is referred to as ‘sSCell’ |

 |
| MediaTek Inc. [11] | In the Rel-17 DSS WID (RP-211345), it is noted that: This work item is limited to FR1, and includes the following objectives for NR Dynamic Spectrum Sharing (DSS):* PDCCH enhancements for cross-carrier scheduling including [RAN1, RAN2]
	+ **PDCCH of SCell scheduling PDSCH or PUSCH on P(S)Cell**
* Note: The total PDCCH blind decoding budget should not be changed as a result of this work
* Note: These enhancements are not specific to DSS and are generally applicable to cross-carrier scheduling in carrier aggregation

Since the feature of “SCell scheduling PDSCH or PUSCH on P(S)Cell” is not specific to DSS and is generally applicable to cross-carrier scheduling in carrier aggregation, we think the following scenarios should be separately reported for both Type A and Type B UE: * lower-numerology sSCell scheduling higher-numerology P(S)Cell
* higher-numerology sSCell scheduling lower-numerology P(S)Cell
* same numerology between sSCell and P(S)Cell

Furthermore, it is agreed in RAN1 #106-bis-e that:Agreement* 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.

It can be seen that “lower-numerology sSCell scheduling higher-numerology P(S)Cell” is not supported in Rel-17 DSS.**Observation: Since the feature of “SCell scheduling PDSCH or PUSCH on P(S)Cell” is not specific to DSS and is generally applicable to cross-carrier scheduling in carrier aggregation, and “lower-numerology sSCell scheduling higher-numerology P(S)Cell” is not supported in Rel-17 DSS as RAN1 #106-bis-e agreement, the following scenarios should be separately reported for both Type A and Type B UE:*** **higher-numerology sSCell scheduling lower-numerology P(S)Cell**
* **same numerology between sSCell and P(S)Cell**
* **both**

**Proposal:****Adopt the following candidate values*** **One or more of supported SCS combinations ({P(S)Cell SCS in kHz, sSCell SCS in kHz}) from following set are indicated by the UE: {15,15}, {15,30}, (15, 60), {30,30}, {30,60},{60,60})**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 34. NR\_DSS | 34-2 | Cross-carrier scheduling from SCell to PCell/PSCell (Type B) | [Support of Cross-carrier scheduling (CCS) from sSCell to PCell/PSCell (Type B)]1. Cross-carrier scheduling from sSCell to PCell/PSCell with CIF
2. sSCell USS set(s) (for CCS from sSCell to PCell/PSCell) and search space sets on PCell/PSCell can be configured so that the UE monitors them in overlapping [slot/symbol] of PCell/PSCell and sSCell
3. Configuration of scaling factor α for BD and CCE limit handling and PDCCH overbooking handling on P(S)Cell
4. FFS: #unicast DCI limits for PCell/PSCell scheduling
* Processing one unicast DCI scheduling DL on PCell/PSCell per PCell/PSCell slot and its aligned N consecutive sSCell slot(s)
* Processing one unicast DCI scheduling UL on PCell/PSCell per PCell/PSCell slot and its aligned N consecutive sSCell slot(s)
* N is based on pair of (PCell/PSCell SCS, sSCell SCS): N=1 for(15,15), (30,30), (60,60) and N=2 for (15,30), (30,60) and N=4 for (15, 60)
1. Same numerology between sSCell and P(S)Cell or sSCell SCS is larger than P(S)Cell SCS
2. FFS: USS set(s) for DCI format 0\_1,1\_1,0\_2,1\_2 configured on sSCell for CCS from sSCell to PCell/PSCell
3. FFS: Support of sSCell deactivation/activation when sSCell cross carrier scheduling to PCell/PSCell is configured
4. FFS: Support of sSCell dormancy when sSCell cross carrier scheduling to PCell/PSCell is configured
5. FFS: PDCCH monitoring occasion(s) is within the first 3 OFDM symbols of a PCell/PSCell slot
6. FFS: Numbers of CORESET configurations and search space sets on sSCell (for PCell/PSCell cross-carrier scheduling)
7. FFS: frame boundary alignment between PCell/PSCell and sSCell
8. FFS: Precoder granularity of REG-bundle size when CCS from sSCell to PCell/PSCell is configured

Note: The SCell configured with Cross-carrier scheduling to PCell/PSCell is referred to as ‘sSCell’ | 6-5 [, 34-1] | Yes |  |  | Per BC | No | Applicable to FR1 only |  | ~~[~~Candidate value set ~~1~~: One or more of supported SCS combinations ({P(S)Cell SCS in kHz, sSCell SCS in kHz}) from following set are indicated by the UE: {15,15}, {15,30}, (15, 60) ~~for N=4~~, {30,30}, {30,60},{60,60})~~Candidate value set 2: frequency band pair(s) for {PCell/PSCell, sSCell}]~~Note: The CCS from sSCell to Pcell is applicable to FR1 only but there can be other Scells in FR2 configured for the UE | Optional with capability signalling |

 |
| Qualcomm Incorporated [12] | The difference between Type-A (FG34-1) and Type-B (FG34-2) is the restriction for search space set / PDCCH monitoring. Therefore, most of the changes proposed for FG34-1 above are directly applicable to FG34-2. The only difference from FG34-1 is the component 2 – that is, symbol-level overlapping of sSCell USS set(s) (for CCS from sSCell to PCell/PSCell) and search space sets on PCell/PSCell is allowed for Type B.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  34. NR\_DSS | 34-2 | Cross-carrier scheduling from SCell to PCell/PSCell (Type B) | ~~[~~Support of Cross-carrier scheduling (CCS) from sSCell to PCell/PSCell (Type B)~~]~~1. Cross-carrier scheduling from sSCell to PCell/PSCell with CIF
2. sSCell USS set(s) (for CCS from sSCell to PCell/PSCell) and search space sets on PCell/PSCell can be configured so that the UE monitors them in overlapping ~~[slot/~~symbol~~]~~ of PCell/PSCell and sSCell
3. Configuration of scaling factor α for BD and CCE limit handling and PDCCH overbooking handling on P(S)Cell
4. ~~FFS:~~ #unicast DCI limits for PCell/PSCell scheduling
* Processing one unicast DCI scheduling DL on PCell/PSCell per PCell/PSCell slot and its aligned N consecutive sSCell slot(s)
* Processing one unicast DCI scheduling UL on PCell/PSCell per PCell/PSCell slot and its aligned N consecutive sSCell slot(s)
* FFS: N is based on pair of (PCell/PSCell SCS, sSCell SCS): N=1 for(15,15), (30,30), (60,60) and N=2 for (15,30), (30,60) and N=4 for (15, 60)
1. Same numerology between sSCell and P(S)Cell or sSCell SCS is larger than P(S)Cell SCS
* P(S)Cell SCS is 15kHz
* The UE reports supported band pair(s) for {P(S)Cell, sSCell} and sSCell SCS from {15kHz, 30kHz, 60kHz} for each pair
1. ~~FFS:~~ USS set(s) for DCI format 0\_1, 1\_1, 0\_2 (if supported), 1\_2 (if supported) configured on sSCell for CCS from sSCell to PCell/PSCell
2. ~~FFS:~~ Support of sSCell deactivation/activation when sSCell cross carrier scheduling to PCell/PSCell is configured
* BD and CCE handling on P(S)Cell based on the scaling factor a unchanged regardless of whether the sSCell is activated/deactivated
1. ~~FFS: Support of sSCell dormancy when sSCell cross carrier scheduling to PCell/PSCell is configured~~
2. ~~FFS:~~ PDCCH monitoring occasion(s) on PCell/PSCell and on sSCell for cross-carrier scheduling to PCell/PSCell is within the first 3 OFDM symbols of a PCell/PSCell slot
3. ~~FFS:~~ Numbers of CORESET configurations and search space sets on sSCell (for PCell/PSCell cross-carrier scheduling) per BWP are 1 and 3, respectively
4. ~~FFS:~~ frame boundary alignment between PCell/PSCell and sSCell
5. ~~FFS:~~ Precoder granularity of REG-bundle size when CCS from sSCell to PCell/PSCell is configured

Note: The SCell configured with Cross-carrier scheduling to PCell/PSCell is referred to as ‘sSCell’ | 6-5 ~~[, 34-1]~~ | Yes |  |  | Per BC | No | Applicable to FR1 only |  | ~~[Candidate value set 1: One or more of supported SCS combinations ({P(S)Cell SCS in kHz, sSCell SCS in kHz}) from following set are indicated by the UE: {15,15}, {15,30}, (15, 60) for N=4, {30,30}, {30,60},{60,60})~~~~Candidate value set 2: frequency band pair(s) for {PCell/PSCell, sSCell}]~~Note: The CCS from sSCell to Pcell is applicable to FR1 only but there can be other Scells in FR2 configured for the UE | Optional with capability signalling |

 |
| Ericsson [13] | * Components
	+ OK to keep the introductory text “[Support of Cross-carrier scheduling (CCS) from sSCell to PCell/PSCell (Type B)]”
	+ Component 1 – agreed
	+ Component 2
		- The “…overlapping [slot/symbol] of PCell/PSCell…” part can be updated by removing the square brackets as follows -- “…overlapping ~~[~~slot/symbol~~]~~ of PCell/PSCell…”. Intention of Type B UE is to allow both slot and symbol level overlap between SS sets on P(S)Cell and SS sets of sSCell. For example, P(S)Cell SS sets can be in first 3 symbols of slot n and sSCell SS sets can be first 3 symbols of a sSCell slot whose starting symbol overlaps with slot n.
	+ Component 3 – agreed
	+ FFS Component 4 on #unicast DCI limits for PCell/PSCell scheduling
		- We propose below for #unicast DCI limits. The proposed limits are aligned with those currently defined for FDD and TDD cases.
			* Processing of N1 unicast DCI(s) scheduling DL for P(S)Cell from sSCell and P(S)Cell, and N2 unicast DCI(s) scheduling UL for P(S)Cell from sSCell and P(S)Cell in slot(s) overlapping with one P(S)Cell slot
				+ (N1, N2) = (1,1) for FDD P(S)Cell; (N1, N2) = (1,2) for TDD P(S)Cell
	+ “7) FFS: USS set(s) for DCI format 0\_1,1\_1,0\_2,1\_2 ~~(if supported)~~ configured on sSCell for CCS from sSCell to PCell/PSCell”
		- OK to capture this as a component as it seems to explain the DCI formats supported on sSCell for CCS from sSCell to P(S)Cell
	+ “8) FFS: Support of sSCell deactivation/activation when sSCell cross carrier scheduling to PCell/PSCell is configured”
		- OK to capture although there is no strict need to capture this as separate component.
	+ “9) FFS: Support of sSCell dormancy when sSCell cross carrier scheduling to PCell/PSCell is configured”
		- OK to capture although there is no strict need to capture this as separate component.
	+ “10) FFS: PDCCH monitoring occasion(s) is within the first 3 OFDM symbols of a PCell/PSCell slot”
		- Not OK to have such restriction as a component in this FG. Considering e.g., 15kHz SCS for P(S)Cell and 30kHz SCS for sSCell, such restriction does not allow full utilization of sSCell slots for sSCell to P(S)Cell schdeduling.
	+ “11) FFS: Numbers of CORESET configurations and search space sets on sSCell (for PCell/PSCell cross-carrier scheduling)”
		- Number of CORESET configurations and search space sets on sSCell should follow existing specification and UE capability indications (i.e., based on UE indication or not of *multipleCORESET* (FG 3-3), *maxNumberSearchSpaces* (FG 3-8). We do not see need to specify additional restrictions separately for those CORESETs/Search space sets used for sSCell to P(S)Cell scheduling
	+ “12) FFS: frame boundary alignment between PCell/PSCell and sSCell”
		- sSCell operation with unaliged frame boundary should be supported. If a need for capability bits to differentiate between support for e.g., a) P(S)Cell+SCell1 with unaligned CA when SCell1 is not used as sSCell and b) P(S)Cell + SCell1 without ualigned CA when SCell1 is used as sSCell is seen, OK to define a separate capabiliry e.g., “FG 34-x: Support of sSCell operation and unaligned CA” with FG 18-7 as a prerequisite for it.
	+ “13) FFS: Precoder granularity of REG-bundle CORESET size when CCS from sSCell to PCell/PSCell is configured”
		- Existing capability indication *precoderGranularityCORESET* (FG 3-7) can be applied without adding any restrictions specifically for sSCell to P(S)Cell scheduling
* Prerequsites
	+ With current agreed structure of FG 34-1 and 34-2, do not see need to add 34-1 as a prerequisite for 34-2. Once details for 34-1 are finalized, it can be checked if a more compact structure/formulation of Type A vs. Type B UE is possible (such discussion can also be left RAN2)
* Notes
	+ Regarding “Candidate value set 1: One or more of supported SCS combinations ({P(S)Cell SCS in kHz, sSCell SCS in kHz}) from following set are indicated by the UE: {15,15}, {15,30}, (15, 60) for N=4, {30,30}, {30,60},{60,60}); Candidate value set 2: frequency band pair(s) for {PCell/PSCell, sSCell}]”
		- OK with indicating Candidate value set1. Do not see need for frequency band pair level indication as proposed by Candidate value set 2 as no band-specific differences have been identified to support the feature.
 |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  34. NR\_DSS | 34-1 | Cross-carrier scheduling from SCell to PCell/PSCell [with search space restrictions] (Type A) | Support of Cross-carrier scheduling from sSCell to PCell/PSCell [with search space restrictions] (Type A)1. Cross-carrier scheduling from sSCell to PCell/PSCell with CIF
2. FFS: sSCell USS set(s) (for CCS from sSCell to PCell/PSCell) and at least following search space sets on PCell/PSCell can only be configured such that UE does not monitor them in same [slot/symbol] of PCell/PSCell and sSCell
	* USS sets for DCI formats 0\_1,1\_1,0\_2,1\_2 (if supported)
	* 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
3. FFS: BD limit handling and any configuration of associated parameters and UE reporting of any associated parameters
4. FFS: #unicast DCI limits for PCell/PSCell scheduling
* Processing one unicast DCI scheduling DL on PCell/PSCell per PCell/PSCell slot and its aligned N consecutive sSCell slot(s)
* Processing one unicast DCI scheduling UL on PCell/PSCell per PCell/PSCell slot and its aligned N consecutive sSCell slot(s)
* N is based on pair of (PCell/PSCell SCS, sSCell SCS): N=1 for(15,15), (30,30), (60,60) and N=2 for (15,30), (30,60) and N=4 for (15, 60)
1. Same numerology between sSCell and P(S)Cell or sSCell SCS is larger than P(S)Cell SCS
2. FFS: USS set(s) for DCI format 0\_1,1\_1,0\_2,1\_2 configured on sSCell for CCS from sSCell to Pcell/PSCell
3. FFS: sSCell USS set(s) (for CCS from sSCell to Pcell/PSCell) and Type0/0A/1/2 CSS sets on Pcell/PSCell can be configured so that the UE monitors them in overlapping [slot/symbol] of Pcell/PSCell and sSCell. FFS overlap handling
4. FFS: Support of monitoring DCI formats 0\_1,1\_1,0\_2,1\_2 on PCell/PSCell USS set(s)
5. FFS: Support of sSCell deactivation/activation when sSCell cross carrier scheduling to PCell/PSCell is configured
6. FFS: Support of sSCell dormancy when sSCell cross carrier scheduling to PCell/PSCell is configured
7. FFS: PDCCH monitoring occasion(s) is within the first 3 OFDM symbols of a PCell/PSCell slot
8. FFS: Numbers of CORESET configurations and search space sets on sSCell (for PCell/PSCell cross-carrier scheduling) per BWP are 1 and 3, respectively
9. FFS: frame boundary alignment between PCell/PSCell and sSCell
10. FFS: Precoder granularity of REG-bundle size when CCS from sSCell to PCell/PSCell is configured
 | 6-5 | Yes |  |  | Per BC | No | Applicable to FR1 only |  | [Candidate value set 1: One or more of supported SCS combinations ({P(S)Cell SCS in kHz, sSCell SCS in kHz}) from following set are indicated by the UE: {15,15}, {15,30}, (15, 60) for N=4, {30,30}, {30,60},{60,60})Candidate value set 2: frequency band pair(s) for {PCell/PSCell, sSCell}]Note: The CCS from sSCell to PCell is applicable to FR1 only but there can be other SCells in FR2 configured for the UE | Optional with capability signalling |

|  |  |
| --- | --- |
| Company | Summary |
| Huawei/HiSilicon [2] | Regarding the component bullet 7 for FG 34-1:* FFS: USS set(s) for DCI format 0\_1,1\_1,0\_2,1\_2 configured on sSCell for CCS from sSCell to PCell/PSCell

If a UE supports cross-carrier scheduling from SCell to PCell/PSCell, it should supports USS set(s) for DCI format 0\_1, 1\_1 configured on sSCell for CCS from sSCell to PCell/PSCell. However, monitoring DCI format 1\_2 and DCI format 0\_2 is introduced in Rel-16, thus a UE can selectively support this feature. ***Proposal: Update bullet 7 for FG 34-1 to be “USS set(s) for DCI format 0\_1,1\_1 configured on sSCell for CCS from sSCell to PCell/PSCell; and USS set(s) for DCI format 0\_2,1\_2 configured on sSCell for CCS from sSCell to PCell/PSCell if UE supports FG 11-1 (dci-Format1-2And0-2-r16)”.***Regarding the component bullet 12 for FG 34-1:* FFS: PDCCH monitoring occasion(s) is within the first 3 OFDM symbols of a PCell/PSCell slot

The typical case of PCell SCS 15 kHz and sSCell SCS 30 kHz in DSS is taken as an example. When a UE reports to support USS(s) configured in the symbols other than the first 3 symbols of a slot, the PDCCH monitoring occasion(s) location should not be restricted. Even if a UE reports that it supports USS(s) only configured on the first 3 symbols of a slot, the UE should support USS(s) configured on sSCell within the first 3 symbols of any sSCell slot, instead of within the first 3 symbols of any first sSCell slot of the two sSCell slots overlapping with the PCell slot. Otherwise the efficiency of offloading PDCCH from PCell to sSCell is significantly affected.***Proposal: Remove bullet 12 for FG 34-1.***Regarding the component bullet 15 for FG 34-1:* FFS: Precoder granularity of REG-bundle size when CCS from sSCell to PCell/PSCell is configured

We don’t see the necessary to introduce this component. We propose to remove it.***Proposal: Remove bullet 15 for FG 34-1.***According to the agreements of RAN1 #107e, we have the following two proposals.

|  |
| --- |
| **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’
 |

***Proposal: Add bullet 16 for FG 34-1 as “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’”.******Proposal: Add bullet 17 for FG 34-1 as “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’”.***

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  34. NR\_DSS | 34-1 | Cross-carrier scheduling from SCell to PCell/PSCell [with search space restrictions] (Type A) | Support of Cross-carrier scheduling from sSCell to PCell/PSCell [with search space restrictions] (Type A)1. Cross-carrier scheduling from sSCell to PCell/PSCell with CIF
2. FFS: sSCell USS set(s) (for CCS from sSCell to PCell/PSCell) and at least following search space sets on PCell/PSCell can only be configured such that UE does not monitor them in same [slot/symbol] of PCell/PSCell and sSCell
	* USS sets for DCI formats 0\_1,1\_1,0\_2,1\_2 (if supported)
	* 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
3. FFS: BD limit handling and any configuration of associated parameters and UE reporting of any associated parameters
4. FFS: #unicast DCI limits for PCell/PSCell scheduling
* Processing one unicast DCI scheduling DL on PCell/PSCell per PCell/PSCell slot and its aligned N consecutive sSCell slot(s)
* Processing one unicast DCI scheduling UL on PCell/PSCell per PCell/PSCell slot and its aligned N consecutive sSCell slot(s)
* N is based on pair of (PCell/PSCell SCS, sSCell SCS): N=1 for(15,15), (30,30), (60,60) and N=2 for (15,30), (30,60) and N=4 for (15, 60)
1. Same numerology between sSCell and P(S)Cell or sSCell SCS is larger than P(S)Cell SCS
2. ~~FFS:~~ USS set(s) for DCI format 0\_1,1\_1~~,0\_2,1\_2~~ configured on sSCell for CCS from sSCell to Pcell/PSCell; and USS set(s) for DCI format 0\_2,1\_2 configured on sSCell for CCS from sSCell to PCell/PSCell if UE supports FG 11-1 (*dci-Format1-2And0-2-r16*)
3. FFS: sSCell USS set(s) (for CCS from sSCell to Pcell/PSCell) and Type0/0A/1/2 CSS sets on Pcell/PSCell can be configured so that the UE monitors them in overlapping [slot/symbol] of Pcell/PSCell and sSCell. FFS overlap handling
4. FFS: Support of monitoring DCI formats 0\_1,1\_1,0\_2,1\_2 on PCell/PSCell USS set(s)
5. FFS: Support of sSCell deactivation/activation when sSCell cross carrier scheduling to PCell/PSCell is configured
6. FFS: Support of sSCell dormancy when sSCell cross carrier scheduling to PCell/PSCell is configured
7. ~~FFS: PDCCH monitoring occasion(s) is within the first 3 OFDM symbols of a PCell/PSCell slot~~
8. FFS: Numbers of CORESET configurations and search space sets on sSCell (for PCell/PSCell cross-carrier scheduling) per BWP are 1 and 3, respectively
9. FFS: frame boundary alignment between PCell/PSCell and sSCell
10. ~~FFS: Precoder granularity of REG-bundle size when CCS from sSCell to PCell/PSCell is configured~~
11. 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’
12. 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’
 | 6-5 | Yes |  |  | Per BC | No | Applicable to FR1 only |  | [Candidate value set 1: One or more of supported SCS combinations ({P(S)Cell SCS in kHz, sSCell SCS in kHz}) from following set are indicated by the UE: {15,15}, {15,30}, (15, 60) for N=4, {30,30}, {30,60},{60,60})Candidate value set 2: frequency band pair(s) for {PCell/PSCell, sSCell}]Note: The CCS from sSCell to PCell is applicable to FR1 only but there can be other SCells in FR2 configured for the UE | Optional with capability signalling |

 |
| Vivo [3] |

|  |
| --- |
| **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

**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’
 |

According to the agreements, there is no additional restriction for type A UE on Type-0/0A/1/2-CSS sets configurations, except that USS/Type3-CSS sets on Pcell/PScell should not overlap with USS sets for sScell scheduling Pcell on sScell. While for type B UE, those SS sets can be overlapped. Therefore, the bracket can be removed from ‘[with search space restrictions]’ for FG 34-1, while 8) should be updated to align with the agreement, besides, 7), FFS in 8) and the highlighting in 2) can also be removed. Besides, since the same BD scheme is used for both UE types, 3) should be changed to ‘Configuration of scaling factor α for BD and CCE limit handling and PDCCH overbooking handling on P(S)Cell’ to align with type B UE, and the highlighting can be removed. Consequently, FG 34-1 can be updated as below:

|  |  |
| --- | --- |
| Cross-carrier scheduling from SCell to PCell/PSCell with search space restrictions (Type A) | Support of Cross-carrier scheduling from sSCell to PCell/PSCell with search space restrictions (Type A)1. Cross-carrier scheduling from sSCell to PCell/PSCell with CIF
2. search space restrictions ~~FFS~~: sSCell USS set(s) (for CCS from sSCell to PCell/PSCell) and at least following search space sets on PCell/PSCell can only be configured such that UE does not monitor them in same [slot/symbol] of PCell/PSCell and sSCell
	* USS sets for DCI formats 0\_1,1\_1,0\_2,1\_2 (if supported)
	* 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
3. Configuration of scaling factor α for BD and CCE limit handling and PDCCH overbooking handling on P(S)Cell
* Processing one unicast DCI scheduling DL on PCell/PSCell per PCell/PSCell slot and its aligned N consecutive sSCell slot(s)
* Processing one unicast DCI scheduling UL on PCell/PSCell per PCell/PSCell slot and its aligned N consecutive sSCell slot(s)
* N is based on pair of (PCell/PSCell SCS, sSCell SCS): N=1 for(15,15), (30,30), (60,60) and N=2 for (15,30), (30,60) and N=4 for (15, 60)
1. Same numerology between sSCell and P(S)Cell or sSCell SCS is larger than P(S)Cell SCS
2. sSCell USS set(s) (for CCS from sSCell to Pcell/PSCell) and Type0/0A/1/2 CSS sets on Pcell/PSCell can be configured so that
* 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’
1. 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’ is allowedFFS: Support of monitoring DCI formats 0\_1,1\_1,0\_2,1\_2 on PCell/PSCell USS set(s)
2. FFS: Support of sSCell deactivation/activation when sSCell cross carrier scheduling to PCell/PSCell is configured
3. FFS: Support of sSCell dormancy when sSCell cross carrier scheduling to PCell/PSCell is configured
4. FFS: PDCCH monitoring occasion(s) is within the first 3 OFDM symbols of a PCell/PSCell slot
5. FFS: Numbers of CORESET configurations and search space sets on sSCell (for PCell/PSCell cross-carrier scheduling) per BWP are 1 and 3, respectively
6. FFS: frame boundary alignment between PCell/PSCell and sSCell
7. FFS: Precoder granularity of REG-bundle size when CCS from sSCell to PCell/PSCell is configured
 |

Proposal. For the UE feature on 34-1, changes proposed in Table.1, including the following aspects, should be considered* + **Remove [] from ‘[with search space restrictions]’**
	+ **Remove the highlighting from 2)**
	+ **Update 8) to include:‘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’ is allowed’**
	+ **Remove ‘FFS’ in 8)**
	+ **Remove 7)**
	+ **Change 3) to ‘Configuration of scaling factor α for BD and CCE limit handling and PDCCH overbooking handling on P(S)Cell’**
* **The granularity of feature 34-1**

In the last meeting, it was discussed whether the following candidate value sets are needed.[Candidate value set 1: One or more of supported SCS combinations ({P(S)Cell SCS in kHz, sSCell SCS in kHz}) from following set are indicated by the UE: {15,15}, {15,30}, (15, 60) for N=4, {30,30}, {30,60},{60,60})Candidate value set 2: frequency band pair(s) for {PCell/PSCell, sSCell}]BandCombination ::= SEQUENCE { bandList SEQUENCE (SIZE (1..maxSimultaneousBands)) OF BandParameters, featureSetCombination FeatureSetCombinationId, ca-ParametersEUTRA CA-ParametersEUTRA OPTIONAL, ca-ParametersNR CA-ParametersNR OPTIONAL, mrdc-Parameters MRDC-Parameters OPTIONAL, supportedBandwidthCombinationSet BIT STRING (SIZE (1..32)) OPTIONAL, powerClass-v1530 ENUMERATED {pc2} OPTIONAL}This feature is reported per BC. However, a BC may consist of up to 32 bands, UE should not be mandated to support all possible combinations of {PCell/PSCell, sSCell} on the BC considering the practical scenarios for sScell scheduling Pcell/PScell would be very specific and highly demand-driven. Therefore, further details such as which band(s) in the reported BC can be used for PCell/PSCell and which one(s) are for sScell should be provided to avoid overcomplicated implementation. Besides, considering that the supported SCSs for each {PCell/PSCell, sSCell} pair are also specific, it is also necessary to indicate the candidate value set1 to simplify the implementation. Therefore, both candidate value set1 and candidate value set2 should be included in the UE capability. Besides, the incorrect copy-paste text ‘for N=4’ should be deleted.* **De-activation/dormancy of sScell**

It has been discussed whether there is a need to introduce a new capability of dormancy and deactivation of sScell. The necessity of this indication depends on the WI discussion. If new functionality is also introduced when sScell is de-activated or dormant, a new capability is needed. Otherwise, legacy capability can be reused.Based on the previous discussion, we have the following proposal. The updated FG details can be found in the appendix.Proposal. For the UE feature on 34-1, the following aspects should be considered* + **Both candidate value set1 and candidate value set2 should be supported as part of 34-1**
		- **Delete the wrong text ‘for N=4’ in candidate value set1**
	+ **The necessity of a new capability of dormancy and deactivation of sScell is pending on the WI discussion, if new functionality is introduced for dormancy and deactivation of sScell, new capability should be introduced.**
 |
| ZTE [4] | During RAN1#106b-e meeting, companies discussed whether to split the UE capabilities for sSCell scheduling PCell into “same numerology” and “different numerologies” case. As discussed in DSS session, the “Option A” is adopted for type B UE, which is more like a self-scheduling mechanism. In this regards, it is not necessary to split sSCell scheduling PCell into “same numerology” and “different numerologies” case.Furthermore, the most typical use case for sSCell scheduling PCell is different numerologies case. It is not meaningful to have a capability only for the same numerology case. Thus, we have the following proposal.***Proposal****: Support one UE capability covering both “same numerology” and “different numerology” case for sSCell scheduling PCell.*There is another issue related to UE features and the corresponding agreement in RAN1#106b-e meeting is copied below.

|  |
| --- |
| **[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.
 |

The background of above high-lighted yellow part is how to arrange the USS on sSCell for cross-carrier scheduling to PCell. There are three alternatives in the RAN1#106e agreement which are also copied below.

|  |
| --- |
| * 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

* Alt2
	+ The additional BD limitation is per P(S)Cell slot and no further restrictions
* Alt3
	+ 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
 |

For further consideration on whether dividing BD/CCE budget per sSCell slot among sSCell slots overlapped with one PCell slot, Alt1 is slightly preferred with BD/CCE equal split for the sSCell slots overlapping with one P(S)Cell slot. Because this will align with the traditional understanding of BD/CCE budget per slot of each scheduling cell and UE can also determine the scaled BD/CCE budget per slot on scheduling cell for each scheduled cell with clear threshold. Alt2 has some additional flexibility on PDCCH candidate allocation among sSCell slots overlapped with one PCell slot. But Alt3 cannot be acceptable due to unreasonable restriction for USS configuration on sSCell. As shown in Figure 1, the USS configuration on sSCell used for scheduling to PCell is restricted within 3 consecutive OFDM symbols which will significantly impact the efficiency of offloading PDCCH to sSCell.Figure 1 An example of Alt3Now Alt.3 is determined to be discussed as part of UE features discussion, we don’t think such restriction is needed for sSCell scheduling PCell.***Proposal 2****: The following restriction is NOT needed for sSCell scheduling PCell.*

|  |
| --- |
| * + - 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
 |

 |
| Nokia/Nokia Shanghai Bell [5] | The same components as with Rel-15 cross-carrier scheduling and Rel-16 cross-carrier scheduling with different SCS should be automatically included by corresponding FGs, if supported by the UE, and the ability for the PCell to be the scheduled cell does not impact those functionalities. Hence, this component is redundant and should be removed. The USS set configuration for CCS to PCell must be supported for the feature to make sense, this component can be confirmedThe SCell activation/deactivation support is a separate mandatory feature for UEs supporting CA already and the cell’s ability to schedule a particular other cell does not impact this feature. This component can be removed.The SCell dormancy support is a separate optional feature (see FGs 18-4/4a) and the cell’s ability to schedule a particular other cell does not impact this feature. This component can be removed as there are separate FGs for this already.This is a minimum support as defined for Rel-15 UEs. The component is redundant and can be removed.The fact that the scheduled cell is a PCell should not have any impact to this. The component should be removed.This is a basic requirement, could be confirmed or removed as redundant.The precoder granularity support has no relation to whether the cross-carrier scheduled cell with the PDCCH happens to be a PCell. This component should be removed. |
| Intel Corporation [6] | * The item 2) could be included since it is aligned with agreed behavior.
* The item 3) can be replaced by ‘Configuration of scaling factor α for BD and CCE limit handling and PDCCH overbooking handling on P(S)Cell’ to align with 34-2, since it was agreed that BD/CCE limits for Type B UEs are applicable for Type A UEs.
* The item 7) can be included as one aspect of 34-1.
* The item 8) & 9) can be updated to reflect the following agreement in RAN1#107-e

|  |
| --- |
| **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’
 |

* The item 10), 11) may be defined as separate FGs, since the basic feature CCS from sSCell to P(S)Cell works without support of sSCell dormancy/deactivation. It can be merged with the one for Type B UE.
* The item 12) is not necessary since the search space configurations monitored on sSCell for cross-carrier scheduling to P(S)Cell may be in a span that is not the first 3 OFDM symbols of a P(S)Cell slot
* Regarding item 14), it was agreed in last meeting unaligned CA can be supported for CCS from sSCell to P(S)Cell. We prefer to differnet a separate FG for unaligned CA. It can be merged with the one for Type B UE.
* It is not clear why item 15) is necessary

**Proposal:** For FG 34-1, it is proposed that* The item 2), 7) can be included
* The item 3) can be replaced by ‘Configuration of scaling factor α for BD and CCE limit handling and PDCCH overbooking handling on P(S)Cell’ to align with 34-2
* The item 8) & 9) can be updated to reflect the following agreement in RAN1#107-e
* The item 10), 11), 14) may be defined as separate FGs.
* The item 12), 15) are not necessary
 |
| Apple [7] |  |
| CMCC [8] | Regarding the component 2) and 7) listed in FG 34-1, agreements of PDCCH monitoring and search space sets configuration for Type A UE have been achieved, the “FFS” can be removed to update the components. Besides, non-fallback DCI formats configured on both P(S)Cell should also be supported, thus item “USS sets for DCI formats 0\_1,1\_1,0\_2,1\_2”can be included as one aspect. **Proposal. Update component 2) and 7) for FG 34-1 as the following:****2) ~~FFS:~~ sSCell USS set(s) (for CCS from sSCell to PCell/PSCell) and at least following search space sets on PCell/PSCell can only be configured such that UE does not monitor them in ~~same~~ overlapping [slot/symbol] of PCell/PSCell and sSCell*** **USS sets for DCI formats 0\_1,1\_1,0\_2,1\_2 ~~(if supported)~~**
* **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**
1. **~~FFS:~~ USS set(s) for DCI format 0\_1,1\_1,0\_2,1\_2 ~~(if supported)~~ configured on sSCell for CCS from sSCell to PCell/PSCell**

Regarding the component 14), there has been a conclusion of supporting unaligned CA for cross-carrier scheduling from sSCell to P(S)Cell in RAN1#106bis-e meeting [2].

|  |
| --- |
| ***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*
 |

Considering the corresponding conclusion listed above, we think it is necessary to include the UE capability for sSCell cross-carrier scheduling P(S)Cell in the case when sSCell is configured with non-zero *ca-SlotOffset*. This CCS case has some future deployment requirements, e.g., unaligned CA of 2.6 GHz (PCell) and 4.9 GHz (sSCell), which the 2.6 GHz PCell is also a DSS carrier with LTE, and sSCell configured with non-zero *ca-SlotOffset* should be supported.Since PDCCH monitoring and BD/CCE limit handling for UE are determined by slot level (per P(S)Cell slot or per sSCell slot), we don’t see there is any additional spec impact on monitoring behavior when frame boundary of sSCell is unaligned with that of P(S)Cell.We prefer to maintain UE capability for supporting the case when sSCell is configured with non-zero *ca-SlotOffset*. Besides, according to the UE feature for MR-DC/CA enhancement, CA with non-aligned frame boundaries of Rel-16 FG 18-7 is already supported, then the UE feature listed in FG 18-7 can be indicated to support DSS scenarios. That is if one UE reports support FG 18-7 and FG 34-1, it means its sSCell can be configured with non-zero *ca-SlotOffset*.**Proposal. Remove the component 14) listed in FG 34-1.**1. **~~FFS: frame boundary alignment between PCell/PSCell and sSCell~~**
 |
| Xiaomi [9] | For component 2), one open issue is how to define the time granularity for simultaneous reception on PCell/PSCell and sSCell. It has been discussed for several meetings and unfortunately no consensus so far. The main concern on CCS from SCell to PCell/PSCell is UE complexity. From this perspective, take slot as the time granularity for PDCCH monitoring on sSCell and PCell/PSCell is sufficient and reasonable.**Proposal: For component 2) under FG 34-1, UE does not monitor sSCell USS sets and search space sets on PCell/PSCell in overlapping slot of PCell/PSCell and sSCell.**In RAN1#107 e-meeting, the following agreement was achieved:

|  |
| --- |
| **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’
 |

In short, there is a restriction related to Type 0/0A/1/2/CSS sets on P(S)Cell for Type A UE, i.e. Type A UE cannot monitor USS sets 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 simultaneously. To make the search space restriction clear, component 2) should address the above agreement with a sub-bullet.**Proposal: Add the following sub-bullet under component 2) in order to complete the big picture on search space restrictions:*** ***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***

In RAN1#107 e-meeting, the following agreement was achieved:

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

The same mechanisms for BD/CCE limit determination and allocation as Type B UE is reused by Type A UE. Accordingly, we have the following agreement:**Proposal: Component 3) should be updated as below:*** ***Configuration of scaling factor α for BD and CCE limit handling and PDCCH overbooking handling on P(S)Cell***

The motivation of supporting CCS from SCell to PCell/PSCell is to increase the NR PDCCH capacity which is reduced on the PCell/PSCell because of LTE CRS. Considering the target scenario is NR-LTE co-existence and only 15 kHz is available for LTE, we think PCell/PSCell should focus on 15 kHz in Rel-17 DSS. **Proposal: In Rel-17 DSS, PCell/PSCell SCS should only be 15 kHz.** |
| Samsung [10] | The following agreements for Type-A UE should be reflected in FG34-1:

|  |
| --- |
| **Agreement (RAN1#107-e)**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 (RAN1#105-e)**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 …
 |

**Proposal:** * **Update component 2) of FG 34-1 incorporating corresponding RAN1#107-e agreement.**

Since all PDCCH monitoring limits are per P(S)Cell slot, determination of an overlap or no-overlap should be with a granularity of P(S)Cell slots. In addition, configuration of non-fallback DCI formats in USS sets on sSCell and all DCI formats including non-fallback DCI formats in USS sets on P(S)Cell should be supported for flexible scheduling on the P(S)Cell, for both Type-A and Type-B UEs. **Proposal:** * **determination of overlap or no-overlap is with a granularity of P(S)Cell slots;**
* **non-fallback DCI formats on sSCell and both fallback and non-fallback DCI formats on P(S)Cell are supported.**

The corresponding component updates of each FG are:For FG 34-1 (Type-A UE)1. ~~FFS:~~ sSCell USS set(s) (for CCS from sSCell to PCell/PSCell) and at least following search space sets on PCell/PSCell can only be configured such that UE does not monitor them in ~~same~~overlapping ~~[~~slot~~/symbol]~~ of PCell/PSCell and sSCell
	1. USS sets for DCI formats 0\_1,1\_1,0\_2,1\_2 ~~(if supported)~~
	2. USS sets for DCI formats 0\_0,1\_0
	3. Type3-CSS set(s) for DCI formats 1\_0/0\_0 with C-RNTI/CS-RNTI/MCS-C-RNTI
	4. 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
2. ~~FFS:~~ USS set(s) for DCI format 0\_1,1\_1,0\_2,1\_2 configured on sSCell for CCS from sSCell to PCell/PSCell
3. ~~FFS:~~ sSCell USS set(s) (for CCS from sSCell to Pcell/PSCell) and ‘Type0/0A/1/2 CSS sets on Pcell/PSCell for DCI formats with CRC not scrambled by C-RNTI/MCS-C-RNTI/CS-RNTI’ can be configured so that the UE can monitor~~s~~ them in overlapping ~~[~~slot~~/symbol]~~ of Pcell/PSCell and sSCell. ~~FFS overlap handling~~
4. ~~FFS: Support of~~ monitoring DCI formats 0\_1,1\_1,0\_2,1\_2 on PCell/PSCell USS set(s) is supported

According to the following agreement, both Type-A and Type-B UEs apply the same BD limit handling:

|  |
| --- |
| **Agreement (RAN1#107-e)*** + - BD/CCE limits for Type B UEs are applicable for Type A UEs supporting cross-carrier scheduling from sSCell to P(S)Cell
 |

The current UE feature list for DSS captures BD/CCE limit handling only for Type-B UEs based on the scaling factor , and assumes the cell counting parameter (s1=1, s2=0). The same should be reflected for Type-A UEs as well. In addition, in our companion Tdoc for the DSS WI [2], we have proposed modifications to the BD/CCE limit handling based on additional (s1, s2) values and additional scaling factor The UE feature can be updated based on the decision on these parameters.**Proposal: Align BD/CCE limit handling for Type-A and Type-B UEs, and update based on DSS WI decision on additional (s1, s2) parameters and new parameter .**The corresponding component updates of each FG are:For FG 34-1 (Type-A UE)1. ~~FFS: BD limit handling and any configuration of associated parameters and UE reporting of any associated parameters~~ Configuration of scaling factor α for BD and CCE limit handling and PDCCH overbooking handling on P(S)Cell

FFS: Configuration of additional (s1, s2) values and/or additional scaling factor NR Rel-15 supports (as part of FG 3-1) processing one unicast DCI scheduling DL and one unicast DCI scheduling UL per slot per scheduled CC for FDD, and one unicast DCI scheduling DL and 2 unicast DCI scheduling UL per slot per scheduled CC for TDD as mandatory UE feature without capability signaling. NR Rel-16, in the framework of cross-carrier scheduling (CCS) from higher SCS to lower SCS, supports (as part of FG 18-5) processing one unicast DCI scheduling DL per N consecutive scheduling CC slot per scheduled CC for FDD scheduling CC, and one unicast DCI scheduling DL per N consecutive scheduling CC slot per scheduled CC for TDD scheduling CC. In addition, FG 18-5b supports processing one unicast DCI scheduling UL per N consecutive scheduling CC slot per scheduled CC for FDD scheduling CC, and 2 unicast DCI scheduling UL per N consecutive scheduling CC slot per scheduled CC for TDD scheduling CC. Herein, N is based on pair of (scheduling CC SCS, scheduled CC SCS): N=2 for (30,15), (60,30), (120,60) and N=4 for (60,5), (120,30), N = 8 for (120,15). For a Type-A UE, since either the P(S)Cell or the sSCell is a scheduling cell for the P(S)Cell in each P(S)Cell slot, the same UE feature as in Rel-15/16 can be maintained.For a Type-B UE, since a DSS UE is intended to have no change to the total PDCCH blind decoding budget compared to a Rel-16 UE, even a Type-B UE is not expected to process more DCI formats than a Rel-15/16 UE. DSS operation enables PDCCH offloading from P(S)Cell to sSCell, so the number of processed DCI for the P(S)Cell can be maintained as in Rel-15/16. **Proposal: For both Type-A and Type-B UEs, the number of processed DCI for the P(S)Cell is maintained as in Rel-15/16 including the case of 2 unicast DCIs scheduling UL per N consecutive scheduling CC slot per scheduled CC for TDD scheduling CC.**The corresponding component update of each FG is:~~FFS:~~ #unicast DCI limits for PCell/PSCell scheduling* Processing one unicast DCI scheduling DL on PCell/PSCell per PCell/PSCell slot and its aligned N consecutive sSCell slot(s)
* Processing ~~one~~K unicast DCI scheduling UL on PCell/PSCell per PCell/PSCell slot and its aligned N consecutive sSCell slot(s)
* N is based on pair of (PCell/PSCell SCS, sSCell SCS): N=1 for(15,15), (30,30), (60,60) and N=2 for (15,30), (30,60) and N=4 for (15, 60)
* K = 1 in case when both PCell/PSCell and sSCell are FDD. Otherwise, K = 2

Support of sSCell deactivation/activation is clear from the following RAN1 agreement. In addition, SCell activation/deactivation is the fundamental functionality in CA operation. This would be the reason why the corresponding UE capability is not defined from Rel-15, i.e., nothing to do with UE capability:

|  |
| --- |
| **Agreement (**RAN1#104-e (Jan/Feb 2021))* When CCS from sSCell to PCell/PSCell is configured, CA activation/deactivation operation for the sSCell is supported
 |

**Proposal: For both Type-A and Type-B UEs, remove ‘Support of sSCell deactivation/activation’ from the component.**The corresponding component update of each FG is:~~FFS: Support of sSCell deactivation/activation when sSCell cross carrier scheduling to PCell/PSCell is configured~~The UE capabilities for SCell dormancy (FG 18-4/18-4a) were defined in Rel-16. In our view, the UE supporting SCell dormancy and sSCell operation respectively should support sSCell dormancy as well. That is, no need to define the combination as a UE capability.**Proposal: For both Type-A and Type-B UEs, remove ‘Support of sSCell dormancy’ from the component.**The corresponding component update of each FG is:~~FFS: Support of sSCell dormancy when sSCell cross carrier scheduling to PCell/PSCell is configured~~The UE feature list for Rel-15/16 [TR 38.822] includes a baseline/mandatory FG 3-1 for PDCCH monitoring, based on which USS sets and certain CSS sets are confined to the first 3 OFDM symbols of a slot. In addition, optional UE features 3-2 and 22-8a support monitoring all search space sets within the same span of 3 consecutive OFDM symbols in the slot. For Rel-17 DSS UEs, same principle as in Rel-15/16 can be followed to confine search space sets on P(S)Cell or on sSCell for scheduling P(S)Cell to the first 3 OFDM symbols of the corresponding scheduling cell. For example, the UE supports monitoring a USS set on P(S)Cell within the first 3 OFDM symbols of P(S)Cell slot, and the UE supports monitoring a USS set on sSCell for scheduling P(S)Cell within the first 3 OFDM symbols of the sSCell slot.The agreement from RAN1#106bis-e leaves the relative configuration (in time domain) of USS sets on the sSCell and USS/CSS sets on the P(S)Cell open, to enable flexible PDCCH offloading from P(S)Cell to sSCell. In particular, for the case of different SCS between P(S)Cell and sSCell, when a slot of P(S)Cell overlaps with multiple slots of sSCell, it is up to gNB configuration how to distribute the USS sets on sSCell for P(S)Cell scheduling among the multiple sSCell slots that overlap with a P(S)Cell slot. Therefore, a baseline UE feature list for DSS should include support for such flexible configuration of search space sets in any sSCell slot overlapping with a P(S)Cell slot. However, it is possible that such flexible distribution of PDCCH candidates among multiple sSCell slots may not be supported by some DSS UE implementations. Accordingly, a separate UE capability can be considered so that the DSS UE can monitor limited locations for USS sets on the sSCell, such as the first [3] OFDM symbols of the P(S)Cell slot or within a single span of [3] consecutive OFDM symbols of a P(S)Cell slot.In principle, the above discussion can apply to both Type-A and Type-B UEs (especially since a same BD/CCE handling is agreed for both Type-A and Type-B UEs). However, since Type-A UE is intended for simplified UE operation, it is reasonable to consider the simplified time-domain configuration as a baseline implementation for Type-A UEs. Therefore, the flexible search space set configuration can be considered only for Type-B UEs.**Proposal: For Type-B UEs, and when P(S)Cell has a smaller SCS configuration than the sSCell, the UE capability should include support of a flexible time-domain configuration of ‘USS sets on sSCell for P(S)Cell scheduling’ in any of the sSCell slots that overlap a same P(S)Cell slot. The PDCCH monitoring occasion(s) is within the first 3 OFDM symbols of the corresponding sSCell slot(s).**The corresponding component updates of each FG are:For FG 34-1 (Type-A UE)12) ~~FFS:~~ PDCCH monitoring occasion(s) is within the first 3 OFDM symbols of a PCell/PSCell slotSimilarly, we do not see the need for separate capability for CORESET and search space sets specific for sSCell.**Proposal: For both Type-A and Type-B UEs, remove ‘Numbers of CORESET configurations and search space sets on sSCell (for PCell/PSCell cross-carrier scheduling)’**The corresponding component update of each FG is:~~FFS: Numbers of CORESET configurations and search space sets on sSCell (for PCell/PSCell cross-carrier scheduling)~~RAN1 is pending for decision whether sSCell can also be configured with unaligned frame boundary with P(S)Cell. Regardless, it is good enough to have Rel-16 FG 18-7 (CA with non-aligned frame boundaries) as it is. If RAN1 agrees to not support unaligned frame boundary between P(S)Cell and sSCell, that can be clarified in RAN1 spec not in UE capability.**Proposal: For both Type-A and Type-B UEs, remove ‘Frame boundary alignment between PCell/PSCell and sSCell’**The corresponding component update of each FG is:~~FFS: frame boundary alignment between PCell/PSCell and sSCell~~Again, no reason to define a separate capability beyond already existing one, i.e., Rel-15 FG 3-7 *(precoderGranularityCORESET).***Proposal: For both Type-A and Type-B UEs, remove ‘Precoder granularity of REG-bundle size when CCS from sSCell to PCell/PSCell is configured’.**The corresponding component update of each FG is:~~FFS: Precoder granularity of CORESET size when CCS from sSCell to PCell/PSCell is configured~~

|  |  |  |
| --- | --- | --- |
| 34-1 | Cross-carrier scheduling from SCell to PCell/PSCell [with search space restrictions] (Type A) | Support of Cross-carrier scheduling from sSCell to PCell/PSCell [with search space restrictions] (Type A)1. Cross-carrier scheduling from sSCell to PCell/PSCell with CIF
2. sSCell USS set(s) (for CCS from sSCell to PCell/PSCell) and at least following search space sets on PCell/PSCell can only be configured such that UE does not monitor them in overlapping slot of PCell/PSCell and sSCell
	* USS sets for DCI formats 0\_1,1\_1,0\_2,1\_2
	* 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
	* 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
3. Configuration of scaling factor α for BD and CCE limit handling and PDCCH overbooking handling on P(S)CellFFS: Configuration of additional (s1, s2) values and/or additional scaling factor
4. #unicast DCI limits for PCell/PSCell scheduling
* Processing one unicast DCI scheduling DL on PCell/PSCell per PCell/PSCell slot and its aligned N consecutive sSCell slot(s)
* Processing K unicast DCI scheduling UL on PCell/PSCell per PCell/PSCell slot and its aligned N consecutive sSCell slot(s)
* N is based on pair of (PCell/PSCell SCS, sSCell SCS): N=1 for(15,15), (30,30), (60,60) and N=2 for (15,30), (30,60) and N=4 for (15, 60)
* K = 1 in case when both PCell/PSCell and sSCell are FDD. Otherwise, K = 2
1. Same numerology between sSCell and P(S)Cell or sSCell SCS is larger than P(S)Cell SCS
2. USS set(s) for DCI format 0\_1,1\_1,0\_2,1\_2 configured on sSCell for CCS from sSCell to Pcell/PSCell
3. sSCell USS set(s) (for CCS from sSCell to Pcell/PSCell) and Type0/0A/1/2 CSS sets on Pcell/PSCell for DCI formats with CRC not scrambled by C-RNTI/MCS-C-RNTI/CS-RNTI’ can be configured so that the UE can monitor them in overlapping slot of Pcell/PSCell and sSCell.
4. monitoring DCI formats 0\_1,1\_1,0\_2,1\_2 on PCell/PSCell USS set(s) is supported
5. PDCCH monitoring occasion(s) is within the first 3 OFDM symbols of a PCell/PSCell slot
 |

 |
| MediaTek Inc. [11] | In the Rel-17 DSS WID (RP-211345), it is noted that: This work item is limited to FR1, and includes the following objectives for NR Dynamic Spectrum Sharing (DSS):* PDCCH enhancements for cross-carrier scheduling including [RAN1, RAN2]
	+ **PDCCH of SCell scheduling PDSCH or PUSCH on P(S)Cell**
* Note: The total PDCCH blind decoding budget should not be changed as a result of this work
* Note: These enhancements are not specific to DSS and are generally applicable to cross-carrier scheduling in carrier aggregation

Since the feature of “SCell scheduling PDSCH or PUSCH on P(S)Cell” is not specific to DSS and is generally applicable to cross-carrier scheduling in carrier aggregation, we think the following scenarios should be separately reported for both Type A and Type B UE: * lower-numerology sSCell scheduling higher-numerology P(S)Cell
* higher-numerology sSCell scheduling lower-numerology P(S)Cell
* same numerology between sSCell and P(S)Cell

Furthermore, it is agreed in RAN1 #106-bis-e that:Agreement* 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.

It can be seen that “lower-numerology sSCell scheduling higher-numerology P(S)Cell” is not supported in Rel-17 DSS.**Observation: Since the feature of “SCell scheduling PDSCH or PUSCH on P(S)Cell” is not specific to DSS and is generally applicable to cross-carrier scheduling in carrier aggregation, and “lower-numerology sSCell scheduling higher-numerology P(S)Cell” is not supported in Rel-17 DSS as RAN1 #106-bis-e agreement, the following scenarios should be separately reported for both Type A and Type B UE:*** **higher-numerology sSCell scheduling lower-numerology P(S)Cell**
* **same numerology between sSCell and P(S)Cell**
* **both**

**Proposal:****Adopt the following candidate values*** **One or more of supported SCS combinations ({P(S)Cell SCS in kHz, sSCell SCS in kHz}) from following set are indicated by the UE: {15,15}, {15,30}, (15, 60), {30,30}, {30,60},{60,60})**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  34. NR\_DSS | 34-1 | Cross-carrier scheduling from SCell to PCell/PSCell [with search space restrictions] (Type A) | Support of Cross-carrier scheduling from sSCell to PCell/PSCell [with search space restrictions] (Type A)1. Cross-carrier scheduling from sSCell to PCell/PSCell with CIF
2. FFS: sSCell USS set(s) (for CCS from sSCell to PCell/PSCell) and at least following search space sets on PCell/PSCell can only be configured such that UE does not monitor them in same [slot/symbol] of PCell/PSCell and sSCell
	1. USS sets for DCI formats 0\_1,1\_1,0\_2,1\_2 (if supported)
	2. USS sets for DCI formats 0\_0,1\_0
	3. Type3-CSS set(s) for DCI formats 1\_0/0\_0 with C-RNTI/CS-RNTI/MCS-C-RNTI
3. FFS: BD limit handling and any configuration of associated parameters and UE reporting of any associated parameters
4. FFS: #unicast DCI limits for PCell/PSCell scheduling
* Processing one unicast DCI scheduling DL on PCell/PSCell per PCell/PSCell slot and its aligned N consecutive sSCell slot(s)
* Processing one unicast DCI scheduling UL on PCell/PSCell per PCell/PSCell slot and its aligned N consecutive sSCell slot(s)
* N is based on pair of (PCell/PSCell SCS, sSCell SCS): N=1 for(15,15), (30,30), (60,60) and N=2 for (15,30), (30,60) and N=4 for (15, 60)
1. Same numerology between sSCell and P(S)Cell or sSCell SCS is larger than P(S)Cell SCS
2. FFS: USS set(s) for DCI format 0\_1,1\_1,0\_2,1\_2 configured on sSCell for CCS from sSCell to Pcell/PSCell
3. FFS: sSCell USS set(s) (for CCS from sSCell to Pcell/PSCell) and Type0/0A/1/2 CSS sets on Pcell/PSCell can be configured so that the UE monitors them in overlapping [slot/symbol] of Pcell/PSCell and sSCell. FFS overlap handling
4. FFS: Support of monitoring DCI formats 0\_1,1\_1,0\_2,1\_2 on PCell/PSCell USS set(s)
5. FFS: Support of sSCell deactivation/activation when sSCell cross carrier scheduling to PCell/PSCell is configured
6. FFS: Support of sSCell dormancy when sSCell cross carrier scheduling to PCell/PSCell is configured
7. FFS: PDCCH monitoring occasion(s) is within the first 3 OFDM symbols of a PCell/PSCell slot
8. FFS: Numbers of CORESET configurations and search space sets on sSCell (for PCell/PSCell cross-carrier scheduling) per BWP are 1 and 3, respectively
9. FFS: frame boundary alignment between PCell/PSCell and sSCell
10. FFS: Precoder granularity of REG-bundle size when CCS from sSCell to PCell/PSCell is configured
 | 6-5 | Yes |  |  | Per BC | No | Applicable to FR1 only |  | ~~[~~Candidate value set ~~1~~: One or more of supported SCS combinations ({P(S)Cell SCS in kHz, sSCell SCS in kHz}) from following set are indicated by the UE: {15,15}, {15,30}, (15, 60) ~~for N=4~~, {30,30}, {30,60},{60,60})~~Candidate value set 2: frequency band pair(s) for {PCell/PSCell, sSCell}]~~Note: The CCS from sSCell to PCell is applicable to FR1 only but there can be other SCells in FR2 configured for the UE | Optional with capability signalling |

 |
| Qualcomm Incorporated [12] | * Square blacket from “[with search space restrictions]” should be removed.
* For 2), we propose to clarify the restrictions for Type A and delete “FFS”. For “in same [slot/symbol]”, Type A restriction should be slot-level and not symbol-level. In addition, “in same slot” is misleading and not aligned with the agreement at RAN1#105-e meeting. We propose to update as “in ~~same~~ overlapping ~~[~~slot(s)~~/symbol]~~”.
* For 3), RAN1 has agreed to apply the same handling as for Type-B at RAN1#107-e meeting. We propose to delete “FFS” and capture the same description as for Type-B.
* For 4), we propose to approve this component in general and delete “FFS”. Then, we propose to add “FFS” on the 3rd bullet “N is based on pair of …”. The reason is that SCS other than 15kHz for PCell/PSCell is now FFS.
* For 6), we propose to enable for a UE to report supported band pair(s) for {P(S)Cell, sSCell} with sSCell SCS for each pair for the given band combination the UE reports FG34-1. For a given CA band combination, there could be various frequency bands such as FDD, TDD, and unlicensed bands, with inter-band CCs and intra-band CCs with various SCS configurations. Such report is essential to address the issues of implementation/testing.
* For 7), since DCI format 0\_2/1\_2 is based on the other FGs, there should be “(if supported)” for 0\_2 and 1\_2. With this, we are OK to delete “FFS”.
* For 8), following RAN1#107-e agreement have been achieved and hence shall be captured. Regarding the overlap time resolution, it should be “symbol”.
	+ *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’*
* For 9), we are OK to delete “FFS” (with adding “(if supported)” on DCI format 0\_2/1\_2).
* For 10), we are OK to delete “FFS” with clarifying that the BD/CCE limit on the P(S)Cell is based on the scaling factor  regardless of whether the sSCell is activated/deactivated.
* 11) should not be part of FG34-1 and should be based on a separate FG. We propose to create a new FG, FG34-4, for this.
* For 12), we propose to confirm this with clarifying that the PDCCH monitoring occasion(s) here means the monitoring occasion(s) on PCell/PSCell and on sSCell for cross-carrier scheduling to PCell/PSCell. The fundamental assumption/scenario of this Rel-17 DSS enhancements, cross-carrier scheduling from an SCell to PCell/PSCell, is that the PDCCH monitoring is limited in the first 3 OFDM symbols of the PCell/PSCell and hence PDCCH offloading to the other cell is necessary. We do not think this is restrictive to the network/operation as this has been the original assumption that motivates cross-carrier scheduling from SCell to PCell/PSCell.
* For 13), we propose to clarify that in FG34-1, the number of CORESETs on sSCell for PCell/PSCell scheduling is up to one, and the number of search space sets on sSCell for PCell/PSCell cross-carrier scheduling per BWP is up to 3. Since the cross-carrier scheduling from sSCell to PCell/PSCell is enabled only by USS sets with non-fallback DCI formats, large numbers of CORESET/search space sets are not necessary.
* For 14) and 15), “FFS” should be deleted. Support of FG18-7 (unaligned CA) and/or FG3-7 (precoder granularity of CORESET size) do not mean the corresponding feature is supported for PCell/PSCell and sSCell. If necessary, separate UE capabilities should be introduced.

Based on the above, we propose to update the FG34-1 as in the table below. The proposed changes are highlighted by red. Yellow highlight is the remaing FFS that should be resolved during the meeting.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  34. NR\_DSS | 34-1 | Cross-carrier scheduling from SCell to PCell/PSCell ~~[~~with search space restrictions~~]~~ (Type A) | Support of Cross-carrier scheduling from sSCell to PCell/PSCell ~~[~~with search space restrictions~~]~~ (Type A)1. Cross-carrier scheduling from sSCell to PCell/PSCell with CIF
2. ~~FFS:~~ sSCell USS set(s) (for CCS from sSCell to PCell/PSCell) and at least following search space sets on PCell/PSCell can only be configured such that UE does not monitor them in overlapping~~same~~ ~~[~~slot(s)~~/symbol]~~ of PCell/PSCell and sSCell
	* USS sets for DCI formats 0\_1, 1\_1, 0\_2 (if supported),1\_2 (if supported)
	* 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
3. ~~FFS: BD limit handling and any configuration of associated parameters and UE reporting of any associated parameters~~ Configuration of scaling factor α for BD and CCE limit handling and PDCCH overbooking handling on P(S)Cell
4. ~~FFS:~~ #unicast DCI limits for PCell/PSCell scheduling
* Processing one unicast DCI scheduling DL on PCell/PSCell per PCell/PSCell slot and its aligned N consecutive sSCell slot(s)
* Processing one unicast DCI scheduling UL on PCell/PSCell per PCell/PSCell slot and its aligned N consecutive sSCell slot(s)
* FFS: N is based on pair of (PCell/PSCell SCS, sSCell SCS): N=1 for(15,15), (30,30), (60,60) and N=2 for (15,30), (30,60) and N=4 for (15, 60)
1. Same numerology between sSCell and P(S)Cell or sSCell SCS is larger than P(S)Cell SCS
* P(S)Cell SCS is 15kHz
* The UE reports supported band pair(s) for {P(S)Cell, sSCell} and sSCell SCS from {15kHz, 30kHz, 60kHz} for each pair
1. ~~FFS:~~ USS set(s) for DCI format 0\_1,1\_1,0\_2 (if supported),1\_2 (if supported) configured on sSCell for CCS from sSCell to Pcell/PSCell
2. ~~FFS:~~ sSCell USS set(s) (for CCS from sSCell to Pcell/PSCell) and Type0/0A/1/2 CSS sets on Pcell/PSCell can be configured ~~so that the UE monitors them~~ in overlapping ~~[slot/~~symbol~~]~~ of Pcell/PSCell and sSCell. Following are the ~~FFS~~ overlap handling
* 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’
1. ~~FFS:~~ Support of monitoring DCI formats 0\_1,1\_1,0\_2 (if supported),1\_2 (if supported) on PCell/PSCell USS set(s)
2. Support of sSCell deactivation/activation when sSCell cross carrier scheduling to PCell/PSCell is configured
* BD and CCE handling on P(S)Cell based on the scaling factor a unchanged regardless of whether the sSCell is activated/deactivated
1. ~~FFS: Support of sSCell dormancy when sSCell cross carrier scheduling to PCell/PSCell is configured~~
2. ~~FFS:~~ PDCCH monitoring occasion(s) on PCell/PSCell and on sSCell for cross-carrier scheduling to PCell/PSCell is within the first 3 OFDM symbols of a PCell/PSCell slot
3. ~~FFS:~~ Numbers of CORESET configurations and search space sets on sSCell (for PCell/PSCell cross-carrier scheduling) per BWP are 1 and 3, respectively
4. ~~FFS:~~ frame boundary alignment between PCell/PSCell and sSCell
5. ~~FFS:~~ Precoder granularity of REG-bundle size when CCS from sSCell to PCell/PSCell is configured
 | 6-5 | Yes |  |  | Per BC | No | Applicable to FR1 only |  | ~~[Candidate value set 1: One or more of supported SCS combinations ({P(S)Cell SCS in kHz, sSCell SCS in kHz}) from following set are indicated by the UE: {15,15}, {15,30}, (15, 60) for N=4, {30,30}, {30,60},{60,60})~~~~Candidate value set 2: frequency band pair(s) for {PCell/PSCell, sSCell}]~~Note: The CCS from sSCell to PCell is applicable to FR1 only but there can be other SCells in FR2 configured for the UE | Optional with capability signalling |

 |
| Ericsson [13] | * Components
	+ Introductory text can be “Support of Cross-carrier scheduling from sSCell to PCell/PSCell ~~[~~with search space restrictions~~]~~ (Type A)” or Support of Cross-carrier scheduling from sSCell to PCell/PSCell ~~[with search space restrictions]~~ (Type A)”. Also, component numbering should be updated once the details are finalized.
	+ Component 2 – agreed
	+ For below FFS point

“3) FFS: sSCell USS set(s) (for CCS from sSCell to PCell/PSCell) and at least following search space sets on PCell/PSCell can only be configured such that UE does not monitor them in same [slot/symbol] of PCell/PSCell and sSCell* + - USS sets for DCI formats 0\_1,1\_1,0\_2,1\_2 (if supported)
		- 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 ”

One issue is whether the search space configuration restriction is to avoid slot level vs. symbol level overlap. We are OK to avoid overlap at slot level.Propose to update the component as below to reflect RAN1#105-e and RAN1#107-e agreements3) For PDCCH monitoring* sSCell USS set(s) (for CCS from sSCell to PCell/PSCell) and following search space sets on PCell/PSCell can only be configured such that UE does not monitor them in same slot of PCell/PSCell and sSCell
	+ USS sets for DCI formats 0\_1,1\_1,0\_2,1\_2
	+ 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
	+ “4) FFS: BD limit handling and any configuration of associated parameters and UE reporting of any associated parameters”, propose to update as below to reflect RAN1#107-e agreement

4) Configuration of scaling factor α for BD and CCE limit handling and PDCCH overbooking handling on P(S)Cell* + Regarding the FFS Component on #unicast DCI limits for PCell/PSCell scheduling, we propose below for #unicast DCI limits. Value1 for (N1,N2) is aligned with limits currently defined for FDD and TDD cases. For Type A UEs, it is preferable to allow the possibility of more #unicast DCIs per MO due the TDM restriction on search space set configurations. When sSCell is deactivated, the P(S)Cell USS PDCCH monitoring would still have the TDM restriction (i.e., to avoid overlap USS sets configured for sSCell) and having more #DCIs per MO is helpful in such case by allowing possibility for cross-slot scheduling (i.e., along with Mandatory UE capabilities FG 5-30/5-30a). We propose Value2 for (N1, N2) considering this aspect.

5) Processing of N1 unicast DCI(s) scheduling DL for P(S)Cell from sSCell and P(S)Cell, and N2 unicast DCI(s) scheduling UL for P(S)Cell from sSCell and P(S)Cell in slot(s) overlapping with one P(S)Cell slot * Candidate value set for (N1, N2)
	+ Value1: (N1, N2) = (1,1) for FDD P(S)Cell; (N1, N2) = (1,2) for TDD P(S)Cell
	+ Value2: (N1, N2) = (2,2) for FDD P(S)Cell; (N1, N2) = (2,4) for TDD P(S)Cell
	+ Component 6 – agreed
	+ “7) FFS: USS set(s) for DCI format 0\_1,1\_1,0\_2,1\_2 ~~(if supported)~~ configured on sSCell for CCS from sSCell to PCell/PSCell”
		- OK to capture this as a component as it seems to explain the DCI formats supported on sSCell for CCS from sSCell to P(S)Cell
	+ “8) FFS: sSCell USS set(s) (for CCS from sSCell to Pcell/PSCell) and Type0/0A/1/2 CSS sets on Pcell/PSCell can be configured so that the UE monitors them in overlapping [slot/symbol] of Pcell/PSCell and sSCell. FFS overlap handling”
		- Propose to update the component as below to reflect RAN1#107-e agreements. Alternately this can be merged as an additional bullet into Component 3) proposed above

8) sSCell USS set(s) (for CCS from sSCell to Pcell/PSCell) and Type0/0A/1/2 CSS sets on PCell/PSCell can be configured so that the UE monitors them in overlapping slot/symbol of PCell/PSCell and sSCell* 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’
	+ “9) FFS: Support of monitoring DCI formats 0\_1,1\_1,0\_2,1\_2 on PCell/PSCell USS set(s)”
		- Considering the agreements made in RAN1#105-e and RAN1#107-e on PDCCH BD/CCE handling and PDCCH overbooking handling, there is no benefit to restrict DCI formats 0\_1,1\_1,0\_2,1\_2 (for P(S)Cell scheduling) only on sSCell USS set(s) while there are several disadvantages
			* Such restriction does not provide any BD complexity reduction for the UE (since the agreed BD handling and overbooking handling should still be applied). It also does not provide benefit from PDCCH monitoring perspective since monitoring of DCI formats 0-0 and 1-0 using USS sets on P(S)Cell is anyway allowed.
			* Introduction of such restriction (on top of already agreed TDM restriction in RAN1#105-e) would mean essential functionalities (e.g., related to MIMO and CSI triggering) provided by DCI formats 0\_1,1\_1 are precluded for P(S)Cell self-scheduling when sSCell is deactivated (sSCell must be removed via RRC reconfiguration to ‘recover’ the functionality of DCI formats 0\_1,1\_1 on P(S)Cell). When the sSCell is in good radio condition, it must be always be activated regardless of data bursts present or not, which has significant negative impact on UE power consumption. Also, frequent RRC reconfigurations using the limited TDM restricted USS sets on P(S)Cell must be done to remove/add the sSCell based on varying radio conditions.
		- We propose to remove this FFS point and capture that monitoring DCI formats 0\_1,1\_1,0\_2,1\_2 on PCell/PSCell USS set(s) is supported (as proposed in our update to component 3 above)
	+ “10) FFS: Support of sSCell deactivation/activation when sSCell cross carrier scheduling to PCell/PSCell is configured”
		- OK to capture although there is no strict need to capture this as separate component.
	+ “11) FFS: Support of sSCell dormancy when sSCell cross carrier scheduling to PCell/PSCell is configured”
		- OK to capture although there is no strict need to capture this as separate component.
	+ “12) FFS: PDCCH monitoring occasion(s) is within the first 3 OFDM symbols of a PCell/PSCell slot”
		- Not OK to have such restriction as a component in this FG. Considering e.g., 15kHz SCS for P(S)Cell and 30kHz SCS for sSCell, such restriction does not allow full utililation of sSCell slots for sSCell to P(S)Cell schdeduling.
	+ “13) FFS: Numbers of CORESET configurations and search space sets on sSCell (for PCell/PSCell cross-carrier scheduling) per BWP are 1 and 3, respectively ”
		- Number of CORESET configurations and search space sets on sSCell should follow existing specification and UE capability indications (i.e., based on UE indication or not of *multipleCORESET* (FG 3-3), *maxNumberSearchSpaces* (FG 3-8). We do not see need to specify additional restrictions separately for those CORESETs/Search space sets used for sSCell to P(S)Cell scheduling
	+ “14) FFS: frame boundary alignment between PCell/PSCell and sSCell”
		- sSCell operation with unaliged frame boundary should be supported. If a need for capability bits to differentiate between support for e.g., a) P(S)Cell+SCell1 with unaligned CA when SCell1 is not used as sSCell and b) P(S)Cell + SCell1 without ualigned CA when SCell1 is used as sSCell is seen, OK to define a separate capability e.g., “FG 34-x: Support of sSCell operation and unaligned CA” with FG 18-7 as a prerequisite for it.
	+ “15) FFS: Precoder granularity of REG-bundle CORESET size when CCS from sSCell to PCell/PSCell is configured”
		- Existing capability indication *precoderGranularityCORESET* (FG 3-7) can be applied without adding any restrictions specifically for sSCell to P(S)Cell scheduling
* Notes
	+ Regarding “Candidate value set 1: One or more of supported SCS combinations ({P(S)Cell SCS in kHz, sSCell SCS in kHz}) from following set are indicated by the UE: {15,15}, {15,30}, (15, 60) for N=4, {30,30}, {30,60},{60,60}); Candidate value set 2: frequency band pair(s) for {PCell/PSCell, sSCell}]”
		- OK with indicating Candidate value set1. Do not see need for frequency band pair level indication as proposed by Candidate value set 2 as no band-specific differences have been identified to support the feature.
 |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  35. LTE\_NR\_DC\_enh2 | 35-1 | TRS RS for SCell activation | 1. TRS for SCell activation is aperiodic and triggered by MAC CE
2. Temporary RS is based on aperiodic TRS
3. Temporary RS is triggered within the BWP indicated by firstActiveDownlinkBWP-Id for the sSCell
4. A P-TRS of the to-be-activated Scell is indicated as a QCL source for the temporary RS in case of known Scell same as existing specification
5. FFS: Maximum number of temporary RS resource sets that can be configured to UE per CC {1 … 16}
6. FFS: Maximum number of temporary RS resource sets that can be configured to UE across CCs {1 … 256}
7. FFS: Maximum number of triggering states for temporary RS based Scell activation by a MAC-CE {1 … 64}
8. FFS: Maximum number of temporary RS resource sets that can be associated with a triggering state {1 … 16}
9. FFS: Support of temporary RS based SCell activation on one or more from {FR1 FDD, FR1 TDD, FR1 unlicensed, FR2}

[Note: following are reported via the legacy feature, FG2-33 * Maximum number of configured NZP-CSI-RS resources per CC
* Maximum total number of simultaneous NZP-CSI-RS resources in active BWPs across all CCs
* Maximum number simultaneous NZP-CSI-RS resources per CC
* Maximum total number of CSI-RS ports in simultaneous NZP-CSI-RS resources in active BWPs across all CCs]
 | 6-5 | Yes | N/A |  | [Per UE/Per BC/Per band] | [No/Yes] | [No/Yes] |  | [The NZP-CSI-RS configured as temporary RS for fast SCell activation are not considered when counting the maximum NZP-CSI-RS configurations of FG2-33] | Optional with capability signalling |

|  |  |
| --- | --- |
| Company | Summary |
| Huawei/HiSilicon [2] | Regarding the component bullet 5 of FG 35-1, as discussed in RAN1 #107-e meeting, maximum number of temporary RS resource sets reuses the maximum number of NZP-CSI-RS resource sets. In addition, RAN2 holds the same opinion with RAN1 on reusing the value of *maxNrofNZP-CSI-RS-ResourceSets*, which can be found in the excerpt below in RRC CR from RAN2 [3]. Therefore, maximum number of temporary RS resource sets that can be configured to UE per CC is 64. Regarding the component bullet 6, there is no need to keep “FFS” on the maximum number of temporary RS resource sets that can be configured to UE across CCs. The “FFS” in bullet 6 can be removed.

|  |
| --- |
| *SCellActivationRS-Config* information element-- ASN1START-- TAG-SCELLACTIVATIONRS-CONFIG-STARTSCellActivationRS-Config-r17 ::= SEQUENCE { scellActivationRS-Id-r17 SCellActivationRS-ConfigId-r17, resourceSet-r17 NZP-CSI-RS-ResourceSetID, gapBetweenBursts-r17 INTEGER (2..31) OPTIONAL, -- Need R qcl-Info-r17 SEQUENCE (SIZE(1..maxNrofAP-CSI-RS-ResourcesPerSet)) OF TCI-StateId, ...}-- TAG-SCELLACTIVATIONRS-CONFIG-STOP-- ASN1STOP |
| maxNrofNZP-CSI-RS-ResourceSets INTEGER ::= 64 -- Maximum number of NZP CSI-RS resource sets per cellmaxNrofNZP-CSI-RS-ResourceSets-1 INTEGER ::= 63 -- Maximum number of NZP CSI-RS resource sets per cell minus 1 |

***Proposal: Update bullet 5 for FG 35-1 to be “Maximum number of temporary RS resource sets that can be configured to UE per CC is 64”.*** ***Proposal: Update bullet 6 for FG 35-1 to be “Maximum number of temporary RS resource sets that can be configured to UE across CCs is 256”.*** Regarding the components bullet 7 and 8, they are only associated with Alt2 (Reuse A-TRS triggering framework). However, according to RAN2 agreements for TRS-based Scell activation [4], Alt1 (Bitmap approach in MAC-CE) is adopted. Therefore, it is unnecessary to discuss them anymore.***Proposal: Remove components bullet 7 and 8.***Regarding the component bullet 9, for any issue of unlicensed bands, the existing Rel-16 solution for per-UE capability can be reused. Therefore, no additional restrictions are required.***Proposal: Update bullet 9 for FG 35-1 to be “FFS: Support of temporary RS based SCell activation on one or more from {FR1 FDD, FR1 TDD, FR2}”.***Regarding the note in the components for FG 35-1, it should be removed. Temporary RS is based on tracking RS, it is not related to FG 2-33 which is associated to CSI feedback with CSI-RS for channel measurement and IM. ***Proposal: Remove the note in the components for FG 35-1.***

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  35. LTE\_NR\_DC\_enh2 | 35-1 | TRS RS for SCell activation | 1. TRS for SCell activation is aperiodic and triggered by MAC CE
2. Temporary RS is based on aperiodic TRS
3. Temporary RS is triggered within the BWP indicated by firstActiveDownlinkBWP-Id for the sSCell
4. A P-TRS of the to-be-activated Scell is indicated as a QCL source for the temporary RS in case of known Scell same as existing specification
5. ~~FFS:~~ Maximum number of temporary RS resource sets that can be configured to UE per CC is 64~~{1 … 16}~~
6. ~~FFS:~~ Maximum number of temporary RS resource sets that can be configured to UE across CCs is 256~~{1 … 256}~~
7. ~~FFS: Maximum number of triggering states for temporary RS based Scell activation by a MAC-CE {1 … 64}~~
8. ~~FFS: Maximum number of temporary RS resource sets that can be associated with a triggering state {1 … 16}~~
9. FFS: Support of temporary RS based SCell activation on one or more from {FR1 FDD, FR1 TDD, ~~FR1 unlicensed,~~ FR2}

~~[Note: following are reported via the legacy feature, FG2-33~~ * ~~Maximum number of configured NZP-CSI-RS resources per CC~~
* ~~Maximum total number of simultaneous NZP-CSI-RS resources in active BWPs across all CCs~~
* ~~Maximum number simultaneous NZP-CSI-RS resources per CC~~
* ~~Maximum total number of CSI-RS ports in simultaneous NZP-CSI-RS resources in active BWPs across all CCs]~~
 | 6-5 | Yes | N/A |  | [Per UE/Per BC/Per band] | [No/Yes] | [No/Yes] |  | [The NZP-CSI-RS configured as temporary RS for fast SCell activation are not considered when counting the maximum NZP-CSI-RS configurations of FG2-33] | Optional with capability signalling |

 |
| Vivo [3] | According to clause 5.1.2.5.3 in 38.214, ‘Aperiodic CSI-RS for tracking for fast SCell activation’ is used to indicate the temporary RS, thus it is proposed to replace temporary RS in 35-1 to the wording used in 38.214.Proposal. For the UE feature on 35-1, ‘temporary RS’ should be replaced by ‘Aperiodic CSI-RS for tracking for fast SCell activation’. |
| ZTE [4] | Most of the description parts of FG35-1 can be refined or added once we have more outcome in RAN1#107-e meeting. Regarding the granularity, based on our understanding, it is more appropriate to define the fast SCell activation as a per-UE capability since most of its components are baseband processing. Even it may require some RF requirements, it may be common to different bands. Thus, we propose to make FG35-1 as a per UE capability.***Proposal****: Update FG35-1 as a per UE capability.* |
| Nokia/Nokia Shanghai Bell [5] | * **34-2:**
* Type can be confirmed as “per UE”.
* Need for FR1/FR2 differentiation should be ”yes”, since testability needs have shown that in cases like this FR differentiation has been needed. It is OK include TDD/FDD and FR1 unlicensed differentiation as well.
* Confirm the note stating that The NZP-CSI-RS configured as temporary RS for fast SCell activation are not considered when counting the maximum NZP-CSI-RS configurations of FG2-33.

The RAN2 LS to RAN1 in [**R1-2200890**](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_108-e/Docs/R1-2200890.zip)*LS on RAN2 agreements for TRS-based Scell activation* provides the draft RRC and MAC CRs with value ranges for the feature and allows RAN1 to close the FFS points on components 5 to 9 in FG35-1. MAC-specification provides a 8-bit TRS-ID per SCell that is being activated and the *maxNrofSCellActRS-r17* that can be configured is set to 255. That is, there are 256 triggering states (or rather *SCellActivationRS-Config*s) per SCell, of which zero-value is reserved to “no TRS” and range 1…255 can point to a maximum of 255 configured *SCellActivationRS-Config*s.

|  |
| --- |
| CSI-MeasConfig ::= SEQUENCE {[-clip-clip-clip-] [[ scellActivationRS-ConfigToAddModList-r17 SEQUENCE (SIZE ((1.. maxNrofSCellActRS-r17)) OF SCellActivationRS-Config-r17 OPTIONAL, -- Need N scellActivationRS-ConfigToReleaseList-r17 SEQUENCE (SIZE ((1.. maxNrofSCellActRS-r17)) OF SCellActivationRS-ConfigId-r17 OPTIONAL -- Need N ]]\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*SCellActivationRS-Config-r17 ::= SEQUENCE { scellActivationRS-Id-r17 SCellActivationRS-ConfigId-r17, resourceSet-r17 NZP-CSI-RS-ResourceSetID, gapBetweenBursts-r17 INTEGER (2..31) OPTIONAL, -- Need R qcl-Info-r17 SEQUENCE (SIZE(1..maxNrofAP-CSI-RS-ResourcesPerSet)) OF TCI-StateId, ...}\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*SCellActivationRS-ConfigId-r17 ::= INTEGER (1.. maxNrofSCellActRS-r17)\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*maxNrofSCellActRS-r17 INTEGER ::= 255 -- Max number of RS configurations per SCell for SCell activation |

1. FFS: Maximum number of temporary RS resource sets that can be configured to UE per CC {1 … 16}
2. FFS: Maximum number of temporary RS resource sets that can be configured to UE across CCs {1 … 256}
3. FFS: Maximum number of triggering states for temporary RS based Scell activation by a MAC-CE {1 … 64}
4. FFS: Maximum number of temporary RS resource sets that can be associated with a triggering state {1 … 16}
5. FFS: Support of temporary RS based SCell activation on one or more from {FR1 FDD, FR1 TDD, FR1 unlicensed, FR2}

5) This value should be set to 16.6) This value should be component 5 x # of SCells supported, that is, 16 x # of SCells.7) This value should be 256, of which zero-value means no TRS triggered in this SCell and 255 *SCellActivationRS-ConfigID*s each pointing to an *SCellActivationRS-Config* can be configured.8) This component is obsolete and can be removed.9) This is not a component as such, but carrier-type differentiation as commented above, and can be removed. |
| Intel Corporation [6] |  |
| Apple [7] |  |
| CMCC [8] |  |
| Xiaomi [9] |  |
| Samsung [10] |  |
| MediaTek Inc. [11] |  |
| Qualcomm Incorporated [12] | * For 5), we propose to discuss the value in the meeting. At RAN1#107-e meeting, RAN1 has agreed that the max number of NZP CSI-RS resource set configurations for temporary RS per serving cell is 16 (=*maxNrofNZP-CSI-RS-ResourceSetsPerConfig*). On the other hand, RAN2 has agreed that *maxNrofSCellActRS-r17* = 255 captured in the 38.331 running CR (see attachment in R1-2200890). We propose to discuss which value to pick.
* For 6), we suggest to keep “FFS” and discuss together with 5).
* Based on the RAN2’s agreement (Alt.1 is adopted as informed in R1-2200890), components 7) and 8) are no longer necessary. We propose to delete them.
* For 9), we propose to delete “FFS” and confirm the component (for clarification, we propose to add “for the given band combination”. With this, we are OK with “Per-BC” for this FG35-1 and “NO” for both columns of “Need of FDD/TDD differentiation” and “Need of FR1/FR2 differentiation”.
* We propose to add the following component 10) to clarify the supported bandwidth of the TRS for SCell activation. The additional TRS bandwidths supported as part of Rel-16 TEI shall not belong to FG35-1 (can be a separate FG, see FG35-2).
	+ Component 10): For operation without shared spectrum channel access, the bandwidth of the TRS for SCell activation is the minimum of 52 and resource blocks, or is equal to resource blocks. For operation with shared spectrum channel access, the bandwidth of the TRS for SCell activation is the minimum of 48 and resource blocks, or is equal to resource blocks.
* Regarding “[Note: following are reported via the legacy feature, FG2-33…”, we are OK to delete it.
* Regarding the note column “The NZP-CSI-RS configured as temporary RS for fast SCell activation are not considered when counting the maximum NZP-CSI-RS configurations of FG2-33”, we are OK to delete this.

Based on the above, we propose to update the FG35-1 as in the table below. The proposed changes are highlighted by red.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  35. LTE\_NR\_DC\_enh2 | 35-1 | TRS RS for SCell activation | 1. TRS for SCell activation is aperiodic and triggered by MAC CE
2. Temporary RS is based on aperiodic TRS
3. Temporary RS is triggered within the BWP indicated by firstActiveDownlinkBWP-Id for the sSCell
4. A P-TRS of the to-be-activated Scell is indicated as a QCL source for the temporary RS in case of known Scell same as existing specification
5. FFS: Maximum number of temporary RS resource sets that can be configured to UE per CC {1 … [15 or 255]~~16~~}
6. FFS: Maximum number of temporary RS resource sets that can be configured to UE across CCs {1 … 255~~256~~}
7. ~~FFS: Maximum number of triggering states for temporary RS based Scell activation by a MAC-CE {1 … 64}~~
8. ~~FFS: Maximum number of temporary RS resource sets that can be associated with a triggering state {1 … 16}~~
9. ~~FFS:~~ Support of temporary RS based SCell activation on one or more from {FR1 FDD, FR1 TDD, FR1 unlicensed, FR2} for the given band combination
10. For operation without shared spectrum channel access, the bandwidth of the TRS for SCell activation is the minimum of 52 and resource blocks, or is equal to resource blocks. For operation with shared spectrum channel access, the bandwidth of the TRS for SCell activation is the minimum of 48 and resource blocks, or is equal to resource blocks.

~~[Note: following are reported via the legacy feature, FG2-33~~ * ~~Maximum number of configured NZP-CSI-RS resources per CC~~
* ~~Maximum total number of simultaneous NZP-CSI-RS resources in active BWPs across all CCs~~
* ~~Maximum number simultaneous NZP-CSI-RS resources per CC~~
* ~~Maximum total number of CSI-RS ports in simultaneous NZP-CSI-RS resources in active BWPs across all CCs]~~
 | 6-5 | Yes | N/A |  | ~~[Per UE/~~Per BC~~/Per band]~~ | ~~[~~No~~/Yes]~~ | ~~[~~No~~/Yes]~~ |  | ~~[~~The NZP-CSI-RS configured as temporary RS for fast SCell activation are not considered when counting the maximum NZP-CSI-RS configurations of FG2-33~~]~~ | Optional with capability signalling |

 |
| Ericsson [13] | * Components
	+ Components 1-4 – agreed
	+ Given RAN2 agreement to introduce new MAC CE, propose to a new component “Enhanced SCell Activation/Deactivation MAC CEs for SCell activation and TRS triggering” or modify component 1 accordingly
	+ “5) FFS: Maximum number of temporary RS resource sets that can be configured to UE per CC {1 … 16}”;
	+ “6) FFS: Maximum number of temporary RS resource sets that can be configured to UE across CCs {1 … 256}”
	+ “7) FFS: Maximum number of triggering states for temporary RS based Scell activation by a MAC-CE {1 … 64}”
	+ “8) FFS: Maximum number of temporary RS resource sets that can be associated with a triggering state {1 … 16}”
		- Do not see need to capture these as components. Note - according to RAN2 agreements in [2], up to *maxNrofSCellActRS-r17* =255 RS configurations can be configured per SCell and one octet per SCell is indicated in the MAC CE
	+ “9) FFS: Support of temporary RS based SCell activation on one or more from {FR1 FDD, FR1 TDD, FR1 unlicensed, FR2}”
		- Not required if capability is reported per band as proposed below
* Type
	+ This can be per band indication
* FDD/TDD differentiation and FR1/FR2 differentiation
	+ Not required if capability is reported per band as proposed above
* Notes
	+ “[The NZP-CSI-RS configured as temporary RS for fast SCell activation are not considered when counting the maximum NZP-CSI-RS configurations of FG2-33]”
		- OK to introduce this as a separate UE capability 35-x with 35-1 as prerequisite with understanding that for UEs not indicating 35-x, the NZP-CSI-RS configured as temporary RS for fast SCell activation are considered when counting the maximum NZP-CSI-RS configurations of FG2-33
 |

**Other**

|  |  |
| --- | --- |
| Company | Summary |
| Huawei/HiSilicon [2] |  |
| Vivo [3] |  |
| ZTE [4] |  |
| Nokia/Nokia Shanghai Bell [5] |  |
| Intel Corporation [6] |  |
| Apple [7] | * We propose to introduce a new FG34-1a to cover another simplified Type A UE, i.e., the USS can only be configured on sSCell, but cannot be configured on PCell/PSCell. This is based on the following Working Assumption

|  |
| --- |
| 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.
 |

Even though we agree to support both the sSCell activation/deactivation and sSCell dormancy. Its operation is in contrary to the objective of this WID, i.e., to enable sSCell scheduling SpCell to improve DSS performance. From UE performance perspective, we would prefer to ensure reliable and good performance on the primary cell as much as possible, therefore * We propose UE feature FG34-3 on whether UE support sSCell deactivation/activation
* We propose UE feature FG34-4 on whether UE support sSCell dormancy

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  34. NR-DSS | 34-1a | Further restriction to Type A | Support of monitoring DCI formats 0\_1,1\_1,0\_2,1\_2 on PCell/PSCell USS set(s), | 34-1 | Yes | N/A |  | Per BC | N | N |  |  | Optional with capability signalling |
| 34. NR-DSS | 34-3 | Support of sSCell deactivation/activation  | Support of sSCell deactivation/activation when sSCell cross carrier scheduling to PCell/PSCell is configured  | 34-1/34-2 | Yes | N/A |  | Per BC | N | N |  |  | Optional with capability signalling |
| 34. NR-DSS | 34-4 | Support of sSCell dormancy  | Support of sSCell dormancy when sSCell cross carrier scheduling to PCell/PSCell is configured  | 34-1/34-2 | Yes | N/A |  | Per BC | N | N |  |  | Optional with capability signalling |

 |
| CMCC [8] |  |
| Xiaomi [9] |  |
| Samsung [10] |  |
| MediaTek Inc. [11] |  |
| Qualcomm Incorporated [12] | Considering that the scenario of the Rel-17 DSS feature is low band(s), it is useful to enable precoder-granularity of CORESET size as an optional feature. We propose to specify FG34-3 that a UE can indicate support or wideband RS CORESET (precoder-granularity = CORESET size) on P(S)Cell, sSCell or both P(S)Cell and sSCell.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 34-3 | Precoder-granularity of CORESET size when CCS from sSCell to PCell/PSCell is configured | 1. Precoder granularity of CORESET size can be configured {on sSCell, on PCell/PSCell, or on both sSCell and PCell/PSCell}
2. Candidate pair(s) of frequency band(s) for {PCell/PSCell, sSCell} among the candidate pair(s) reported in FG34-1 or FG34-2
 | 34-1 or 34-2 |  |  |  | Per-BC |  |  |  |  |  |

sSCell dormant BWP operation should not be combined with the basic FGs of cross-carrier scheduling from sSCell to PCell/PSCell. So far, SCell dormant BWP operation was supported in Rel-16 with FG18-4/4a but these FGs do not indicate support of sSCell dormant BWP operation. Therefore, we propose to create a new FG for this.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 34-4 | sSCell dormant BWP operation | BD and CCE handling on P(S)Cell based on the scaling factor a is unchanged regardless of whether the sSCell BWP is dormant/non-dormant | 34-1 or 34-2 |  |  |  |  |  |  |  |  |  |

In Rel-16, additional TRS bandwidths are supported for FDD 10MHz UE channel bandwidth with an optional UE capability signalling. Similar to the legacy TRS case, a separate FG is necessary for the additional TRS bandwidth for temporary RS. We propose to add a new FG, FG35-2, to accommodate this case as in the table below.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 35-2 | Additional bandwidth for TRS for SCell activation | Indicates the UE supported TRS bandwidths, in addition to 52 RBs, for a 10MHz UE channel bandwidth. This field only applies to the BWPs configured with 52 RBs size and 15kHz SCS, in FDD bands.UE inidicates either set 1 or set 2, where:- Supported bandwidth in set 1: {28, 32, 36, 40, 44, 48} RBs- Supported bandwidth in set 2: {32, 36, 40, 44, 48} RBs |  |  |  |  | Per band | FDD only | FR1 only |  |  | Optional with capability signalling |

 |
| Ericsson [13] |  |

# Discussion/Approval Items during RAN1 #108-e — First Checkpoint

After review of contributions submitted to RAN1 #108-e in this agenda item, the following topics were identified by the moderator for discussion/approval during RAN1 #108-e.

**General comments**

|  |  |
| --- | --- |
| Company | Comments/Questions/Suggestions |
|  |  |

# Issue 1: FG 34-1

After review of contributions submitted to RAN1 #108-e in this agenda item, the following is proposed by the moderator. Companies submitted the following views on the moderator’s proposals.

**Proposal: Adopt the following changes highlighted in chromatic fonts, while keeping the yellow highlighting, if any, as shown**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  34. NR\_DSS | 34-1 | Cross-carrier scheduling from SCell to PCell/PSCell ~~[~~with search space restrictions~~]~~ (Type A) --aligned CA | Support of Cross-carrier scheduling from sSCell to PCell/PSCell ~~[~~with search space restrictions~~]~~ (Type A)1. Cross-carrier scheduling from sSCell to PCell/PSCell with CIF
2. Search space restrictions~~FFS~~: sSCell USS set(s) (for CCS from sSCell to PCell/PSCell) and at least following search space sets on PCell/PSCell can only be configured such that UE does not monitor them in ~~same~~ overlapping ~~[~~slot/symbol~~]~~ of PCell/PSCell and sSCell
	* USS sets for DCI formats 0\_1,1\_1,0\_2,1\_2 ~~(if supported)~~
	* 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
	* 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
3. ~~FFS: BD limit handling and any configuration of associated parameters and UE reporting of any associated parameters~~ Configuration of scaling factor α for BD and CCE limit handling and PDCCH overbooking handling on P(S)Cell
4. ~~FFS: #unicast DCI limits for PCell/PSCell scheduling~~
* Processing one unicast DCI scheduling DL on PCell/PSCell per PCell/PSCell slot and its aligned N consecutive sSCell slot(s)
* Processing ~~one~~ K unicast DCI scheduling UL on PCell/PSCell per PCell/PSCell slot and its aligned N consecutive sSCell slot(s)
* FFS: N is based on pair of (PCell/PSCell SCS, sSCell SCS): N=1 for(15,15), (30,30), (60,60) and N=2 for (15,30), (30,60) and N=4 for (15, 60)
* K = 1 in case when both PCell/PSCell and sSCell are FDD. Otherwise, K = 2
1. Same numerology between sSCell and P(S)Cell or sSCell SCS is larger than P(S)Cell SCS
2. ~~FFS:~~ USS set(s) for DCI format 0\_1,1\_1~~,0\_2,1\_2~~ configured on sSCell for CCS from sSCell to Pcell/PSCell and USS set(s) for DCI format 0\_2,1\_2 configured on sSCell for CCS from sSCell to PCell/PSCell if UE supports FG 11-1 (*dci-Format1-2And0-2-r16*)
3. ~~FFS:~~ sSCell USS set(s) (for CCS from sSCell to Pcell/PSCell) and Type0/0A/1/2 CSS sets on Pcell/PSCell can be configured so that ~~the UE monitors them in overlapping [slot/symbol] of Pcell/PSCell and sSCell. FFS overlap handling~~
	1. 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’
	2. 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’ is allowed
4. ~~FFS:~~ Support of monitoring DCI formats 0\_1,1\_1,0\_2,1\_2 on PCell/PSCell USS set(s)
5. ~~FFS: Support of sSCell deactivation/activation when sSCell cross carrier scheduling to PCell/PSCell is configured~~
6. ~~FFS: Support of sSCell dormancy when sSCell cross carrier scheduling to PCell/PSCell is configured~~
7. ~~FFS:~~ PDCCH monitoring occasion(s) on PCell/PSCell and on sSCell for cross-carrier scheduling to PCell/PSCell is within the first 3 OFDM symbols of a PCell/PSCell slot
8. ~~FFS: Numbers of CORESET configurations and search space sets on sSCell (for PCell/PSCell cross-carrier scheduling) per BWP are 1 and 3, respectively~~
9. ~~FFS: frame boundary alignment between PCell/PSCell and sSCell~~
10. ~~FFS: Precoder granularity of REG-bundle size when CCS from sSCell to PCell/PSCell is configured~~
11. 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’
12. 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’
 | 6-5 | Yes |  |  | Per BC | No | Applicable to FR1 only |  | ~~[~~Candidate value set ~~1~~: One or more of supported SCS combinations ({P(S)Cell SCS in kHz, sSCell SCS in kHz}) from following set are indicated by the UE: {15,15}, {15,30}, (15, 60) ~~for N=4~~, {30,30}, {30,60},{60,60})~~Candidate value set 2: frequency band pair(s) for {PCell/PSCell, sSCell}]~~Note: The CCS from sSCell to PCell is applicable to FR1 only but there can be other SCells in FR2 configured for the UE | Optional with capability signalling |
|  34. NR\_DSS | 34-1a | Cross-carrier scheduling from SCell to PCell/PSCell (Type A) --unaligned CA | Support of Cross-carrier scheduling (CCS) from sSCell to PCell/PSCell (Type B) with frame boundary alignment between PCell/PSCell and sSCell | 34-1 | Yes |  |  | Per BC | No | Applicable to FR1 only |  |  | Optional with capability signalling |

|  |  |
| --- | --- |
| Company | Comments/Questions/Suggestions |
| Apple | 1. We do not agree with component 9, i.e., Support of monitoring DCI formats 0\_1,1\_1,0\_2,1\_2 on PCell/PSCell USS set(s), unless we introduce additional FG to indicate whether UE supports USS with non-fallback DCI on PCell/PSCell, i.e., FG34-3 in section 3.42. Component 16 and 17 seem to be redundant  |
| vivo | 34-1a: not support. 34-1 should cover both aligned CA and non-aligned CA casewe don’t see the need to have different FG for aligned CA and non-aligned CA as there is no additional spec impact for PDCCH monitoring and BD/CCE limit handling for sScell scheduling Pcell in un-aligned CA:suggest to update: 34-1: Cross-carrier scheduling from SCell to PCell/PSCell ~~[~~with search space restrictions~~]~~ (Type A) ~~--aligned CA~~* Component2:
	+ as typeA is intended for simplified UE operation, only slot level overlapping should be considered, it is suggested to remove ‘symbol’
		- suggest to update: overlapping ~~[~~slot~~/symbol]~~ of PCell/PSCell and sSCell
* Component4
	+ ‘FFS’ should be removed as the feature is general for FR1 CA, thus the Pcell SCS other than 15kHz should be supported
		- suggest to update: ~~FFS:~~ N is based on pair of (PCell/PSCell SCS, sSCell SCS): N=1 for(15,15), (30,30), (60,60) and N=2 for (15,30), (30,60) and N=4 for (15, 60)
* Component7: support
* Component8:
	+ Sub-bullet 'a can be removed as it is already captured in the newly added sub-bullet ‘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’ in component2
* Component9:
	+ Similar to Component7, the support of DCI format 0\_2,1\_2 on PCell/PSCell USS set(s) should be depended on whether FG 11-1 (dci-Format1-2And0-2-r16) is reported
	+ For the support of DCI format 0\_1,1\_1: support
* Component16/17 are duplicated and can be removed
* Candidate value set2: we agree with candidate value set1 and prefer to keep candidate value set2. Without candidate value set2, for an indicated BC (e.g., 800MHz+4GHz) for 34-1, UE is mandated to support all possible band pairs for {Pcell, sScell}. However, this would unnecessarily complicate UE implementation since some {Pcell, sScell} combinations are not realistic, e.g., sScell on 800MHz+Pcell on 4GHz
	+ suggest to update: ~~[~~Candidate value set ~~1~~: One or more of supported SCS combinations ({P(S)Cell SCS in kHz, sSCell SCS in kHz}) from following set are indicated by the UE: {15,15}, {15,30}, (15, 60) ~~for N=4~~, {30,30}, {30,60},{60,60}) and Candidate value set 2: frequency band pair(s) for {PCell/PSCell, sSCell}]
 |
| ZTE | For 34-1, the following is unnecessary, i.e., “PDCCH monitoring occasion(s) on PCell/PSCell and on sSCell for cross-carrier scheduling to PCell/PSCell is within the first 3 OFDM symbols of a PCell/PSCell slot”. RAN1 has defined UE capability to indicate whether the PDCCH can be in other symbols, e.g., FG3-5b in Rel-15. Whether the PDCCH can be in other symbols can already indicated by them, we don’t need to have such restriction in FG34-1.For the 4) of 34-1, it can be updated as “#unicast DCI limits for PCell/PSCell scheduling” instead of deleting “~~FFS: #unicast DCI limits for PCell/PSCell scheduling~~”. The sSCell can also be used to scheduling other SCells, if we delete “~~FFS: #unicast DCI limits for PCell/PSCell scheduling~~”, it may imply that the number of DCI for scheduling other SCell is also limited by component 4), which is not correct.For 34-1a, we do NOT think it is needed.The UE behavior for unaligned CA is the same for PCell scheduling SCell and sSCell scheduling PCell. In fact, there is nothing change in the spec for unaligned CA for sSCell scheduling PCell. RAN1 has already defined UE capability FG18-7 for unaligned CA, UE can already use it to indicate whether it supports unaligned frame boundary or not. |
| Samsung | FG 34-1- Component 2) Since all PDCCH monitoring limits are per P(S)Cell slot, determination of an overlap or no-overlap should be with a granularity of P(S)Cell slots: Update “in overlapping ~~[~~slot~~/symbol]~~”- Component 3)There is still room to further discuss (s1, s2) and scaling factor : Add “FFS: Configuration of additional (s1, s2) values and/or additional scaling factor - Component 4)It would be better to clarify that component 4) is for PCell/PSCell scheduling (the deleted bullet intended so): Add back “The number of unicast DCI limits for PCell/PSCell scheduling”- Component 8)* Same comment as vivo for (a). Consequently, the description can be reformulated: “~~FFS:~~ sSCell USS set(s) (for CCS from sSCell to Pcell/PSCell) and ‘Type0/0A/1/2 CSS sets on Pcell/PSCell for DCI formats with CRC not scrambled by C-RNTI/MCS-C-RNTI/CS-RNTI’ can be configured so that the UE can monitor~~s~~ them in overlapping ~~[~~slot~~/symbol]~~ of Pcell/PSCell and sSCell. ~~FFS overlap handling~~

- Component 16), 17)Same comment as vivoFG 34-1a: - No need separate FG. If RAN1 ends up with supporting unaligned CA, it is good enough for a UE to indicate Rel-16 FG 18-7 (CA with non-aligned frame boundaries) together with DSS UE capability.- Correspondingly, “-aligned CA” should be removed from the name of FG 34-1 |
| Xiaomi | FG 34-1:Component 2) : similar view as vivo and Samsung, ‘symbol’ should be removedComponent 6): If the FFS point under component 4) is adopted in the end, component 6) is no longer needed. Component 8): share the same view with Samsung. Actually point b is not needed as well as it is a default behavior. We propose to delete component 8).Component 16）&17）： should be removedCandidate value set: the combination with PCell/PSCell SCS other than 15 kHz should be in bracket in order to align with component 4);FG 34-1a:Share the same view with companies that it is not needed. |
| Nokia, NSB | Component 4 is not needed, the same components as with Rel-15 cross-carrier scheduling and Rel-16 cross-carrier scheduling with different SCS should be automatically included by corresponding FGs, if supported by the UE, and the ability for the PCell to be the scheduled cell does not impact those functionalities. This component should be removed.Component 7: okComponent 8: The SCell activation/deactivation support is a separate mandatory feature for UEs supporting CA already and the cell’s ability to schedule a particular other cell does not impact this feature. This component should be removed.Component 9: The SCell dormancy support is a separate optional feature (see FGs 18-4/4a) and the cell’s ability to schedule a particular other cell does not impact this feature. This component should be removed as there are separate FGs for this already.Component 10: agree to remove.Component 11: agree to remove.Component 12: no strong opinion on this component, but it is not strictly needed either.Component 13, 14, 15: agree to remove.FG 34-1a: not needed |
| Intel | Component 2: same view as other companies, overlapping ~~[~~slot~~/symbol]~~ of PCell/PSCell and sSCellComponent 3: we share same view as Samsung on (s1, s2) and Component 12: same comments as ZTE, suggest to remove since it unnecessarily limit UE behavior on sSCell if the UE has a capability of FG 3-5b or other advance PDCCH monitoring capabilities. FG 34-1a: we are fine to remove it |
| Ericsson1 | FG 34-1* Component 2: Delete the last added bullet i.e. “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”. There is no separate configuration for these CSS sets based on C-RNTI/MCS-C-RNTI/CS-RNTI. Also, components 16,17 capture the agreement.
* Component 4: We propose below updates, including clarifying that these limits are for P(S)Cell scheduling, and to also allow a second candidate value set.

For P(S)Cell scheduling,* Processing K1 unicast DCI scheduling DL on PCell/PSCell per PCell/PSCell slot and its aligned N consecutive sSCell slot(s)
* Processing ~~one~~ K2 unicast DCI scheduling UL on PCell/PSCell per PCell/PSCell slot and its aligned N consecutive sSCell slot(s)
* FFS: N is based on pair of (PCell/PSCell SCS, sSCell SCS): N=1 for(15,15), (30,30), (60,60) and N=2 for (15,30), (30,60) and N=4 for (15, 60)
* Candidate value set for (K1, K2)
	+ Value1: (K1, K2) = (1,1) for FDD P(S)Cell; (K1, K2) = (1,2) for TDD P(S)Cell
	+ FFS: Value2: (K1, K2) = (2,2) for FDD P(S)Cell; (K1, K2) = (2,4) for TDD P(S)Cell
* Component 8: Our preference is to capture as below -. Otherwise, replace component 8 with components 16,17 which capture the agreement.

8) sSCell USS set(s) (for CCS from sSCell to Pcell/PSCell) and Type0/0A/1/2 CSS sets on PCell/PSCell can be configured so that the UE monitors them in overlapping slot/symbol of PCell/PSCell and sSCell* 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’
* Component 12) : Do not prefer this restriction to be in 34-1. As a compromise, OK to have UE report its support with or without restriction given in this component i.e., as below. Also, OK to have Value 2 as a separate FG.
	+ - UE reports one of the following candidate values
			* Value 1: PDCCH monitoring occasion(s) on PCell/PSCell and on sSCell for cross-carrier scheduling to PCell/PSCell is within the first 3 OFDM symbols of a PCell/PSCell slot.
			* Value 2: PDCCH monitoring occasion(s) on PCell/PSCell and on sSCell for cross-carrier scheduling to PCell/PSCell is not restricted to the first 3 OFDM symbols of a PCell/PSCell slot
* Components 3),7),9) : OK with updates.
* Components 13),14),15) : OK to delete.
* Components 16), 17): OK to either keep these or the proposed revision to component 8) above
* OK with updates to the Note column.

FG 34-1a* component description should be “Support of Cross-carrier scheduling (CCS) from sSCell to PCell/PSCell (Type ~~B A~~) with ~~frame boundary alignment~~ non-aligned frame boundary between PCell/PSCell and sSCell”?
 |
| Qualcomm | On 2), as long as there is 8) or 16)+17), the last sub-bullet “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” can be deleted.On 10) and 11), there would be discussions in the main session this week. For the time being, we think better to keep FFS. We support current 12).We do not think it makes sense to delete 13) and 15). Regarding unaligned CA, we have not agreed to support it between P(S)Cell and sSCell. Therefore, at least separate capability is necessary. We support current FG34-1a.On candidate value sets 1 and 2, we can compromise to allow non-15kHz P(S)Cell (i.e., having set 1). However, then we prefer to keep set 2. |

# Issue 2: FG 34-2

After review of contributions submitted to RAN1 #108-e in this agenda item, the following is proposed by the moderator. Companies submitted the following views on the moderator’s proposals.

**Proposal: Adopt the following changes highlighted in chromatic fonts, while keeping the yellow highlighting, if any, as shown**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  34. NR\_DSS | 34-2 | Cross-carrier scheduling from SCell to PCell/PSCell (Type B) – aligned CA | ~~[~~Support of Cross-carrier scheduling (CCS) from sSCell to PCell/PSCell (Type B)~~]~~ with frame boundary alignment between PCell/PSCell and sSCell1. Cross-carrier scheduling from sSCell to PCell/PSCell with CIF
2. sSCell USS set(s) (for CCS from sSCell to PCell/PSCell) and search space sets on PCell/PSCell can be configured so that the UE monitors them in overlapping ~~[~~slot/symbol~~]~~ of PCell/PSCell and sSCell
3. Configuration of scaling factor α for BD and CCE limit handling and PDCCH overbooking handling on P(S)Cell
4. ~~FFS:~~ #unicast DCI limits for PCell/PSCell scheduling
* Processing one unicast DCI scheduling DL on PCell/PSCell per PCell/PSCell slot and its aligned N consecutive sSCell slot(s)
* Processing one unicast DCI scheduling UL on PCell/PSCell per PCell/PSCell slot and its aligned N consecutive sSCell slot(s)
* FFS: N is based on pair of (PCell/PSCell SCS, sSCell SCS): N=1 for(15,15), (30,30), (60,60) and N=2 for (15,30), (30,60) and N=4 for (15, 60)
1. Same numerology between sSCell and P(S)Cell or sSCell SCS is larger than P(S)Cell SCS
2. ~~FFS:~~ USS set(s) for DCI format 0\_1,1\_1~~,0\_2,1\_2~~ configured on sSCell for CCS from sSCell to PCell/PSCell and USS set(s) for DCI format 0\_2,1\_2 configured on sSCell for CCS from sSCell to PCell/PSCell if UE supports FG 11-1 (*dci-Format1-2And0-2-r16*)
3. ~~FFS: Support of sSCell deactivation/activation when sSCell cross carrier scheduling to PCell/PSCell is configured~~
4. ~~FFS: Support of sSCell dormancy when sSCell cross carrier scheduling to PCell/PSCell is configured~~
5. ~~FFS:~~ PDCCH monitoring occasion(s) on PCell/PSCell and on sSCell for cross-carrier scheduling to PCell/PSCell is within the first 3 OFDM symbols of a PCell/PSCell slot
6. ~~FFS: Numbers of CORESET configurations and search space sets on sSCell (for PCell/PSCell cross-carrier scheduling)~~
7. ~~FFS: frame boundary alignment between PCell/PSCell and sSCell~~
8. ~~FFS: Precoder granularity of REG-bundle size when CCS from sSCell to PCell/PSCell is configured~~

Note: The SCell configured with Cross-carrier scheduling to Pcell/PSCell is referred to as ‘sSCell’ | 6-5 ~~[, 34-1]~~ | Yes |  |  | Per BC | No | Applicable to FR1 only |  | ~~[~~Candidate value set ~~1~~: One or more of supported SCS combinations ({P(S)Cell SCS in kHz, sSCell SCS in kHz}) from following set are indicated by the UE: {15,15}, {15,30}, (15, 60) ~~for N=4~~, {30,30}, {30,60},{60,60}]~~Candidate value set 2: frequency band pair(s) for {Pcell/PSCell, sSCell}]~~Note: The CCS from sSCell to Pcell is applicable to FR1 only but there can be other Scells in FR2 configured for the UE | Optional with capability signalling |
|  34. NR\_DSS | 34-2a | Cross-carrier scheduling from SCell to Pcell/PSCell (Type B) - -unaligned CA | Support of Cross-carrier scheduling (CCS) from sSCell to Pcell/PSCell (Type B) with frame boundary alignment between Pcell/PSCell and sSCell | 34-2 | Yes |  |  | Per BC | No | Applicable to FR1 only |  |  | Optional with capability signalling |

|  |  |
| --- | --- |
| Company | Comments/Questions/Suggestions |
| vivo | 34-2a: not support. 34-2 should cover both aligned CA and non-aligned CA casewe don’t see the need to have different FG for aligned CA and non-aligned CA as there is no additional spec impact for PDCCH monitoring and BD/CCE limit handling for sScell scheduling Pcell in un-aligned CA:34-2suggest to update: Cross-carrier scheduling from SCell to PCell/PSCell (Type B) ~~–aligned CA~~* Component2:
	+ only slot level overlapping should be considered, it is suggested to remove ‘symbol’
		- suggest to update: overlapping ~~[~~slot~~/symbol]~~ of PCell/PSCell and sSCell
* Component4
	+ ‘FFS’ should be removed as the feature is general for FR1 CA, thus the Pcell SCS other than 15kHz should be supported
		- suggest to update:  ~~FFS:~~ N is based on pair of (PCell/PSCell SCS, sSCell SCS): N=1 for(15,15), (30,30), (60,60) and N=2 for (15,30), (30,60) and N=4 for (15, 60)
* Component7: support
* Candidate value set2: we agree with candidate value set1 and prefer to keep candidate value set2. Without candidate value set2, for an indicated BC (e.g., 800MHz+4GHz) for 34-1, UE is mandated to support all possible band pairs for {Pcell, sScell}. However, this would unnecessarily complicate UE implementation since some {Pcell, sScell} combinations are not realistic, e.g., sScell on 800MHz+Pcell on 4GHz
	+ suggest to update: ~~[~~Candidate value set ~~1~~: One or more of supported SCS combinations ({P(S)Cell SCS in kHz, sSCell SCS in kHz}) from following set are indicated by the UE: {15,15}, {15,30}, (15, 60) ~~for N=4~~, {30,30}, {30,60},{60,60}] and Candidate value set 2: frequency band pair(s) for {PCell/PSCell, sSCell}]
 |
| ZTE | Similar view as for FG34-1.For 34-2, the following is unnecessary, i.e., “PDCCH monitoring occasion(s) on PCell/PSCell and on sSCell for cross-carrier scheduling to PCell/PSCell is within the first 3 OFDM symbols of a PCell/PSCell slot”. RAN1 has defined UE capability to indicate whether the PDCCH can be in other symbols, e.g., FG3-5b in Rel-15. Whether the PDCCH can be in other symbols can already indicated by them, we don’t need to have such restriction in FG34-1.For 34-2a, we do NOT think it is needed.The UE behavior for unaligned CA is the same for PCell scheduling SCell and sSCell scheduling PCell. In fact, there is nothing change in the spec for unaligned CA for sSCell scheduling PCell. RAN1 has already defined UE capability FG18-7 for unaligned CA, UE can already use it to indicate whether it supports unaligned frame boundary or not. |
| Samsung | FG 34-2a: (same comment provided for FG34-1a) No need separate FG. If RAN1 ends up with supporting unaligned CA, it is good enough for a UE to indicate Rel-16 FG 18-7 (CA with non-aligned frame boundaries) together with DSS UE capability.Correspondingly, FG name and component description for FG 34-2 should be updatedFG 34-2- Component 2) (same comment provided for FG34-1) Since all PDCCH monitoring limits are per P(S)Cell slot, determination of an overlap or no-overlap should be with a granularity of P(S)Cell slots: Update “in overlapping ~~[~~slot~~/symbol]~~”- Component 3)(same comment provided for FG34-1) There is still room to further discuss (s1, s2) and scaling factor : add “FFS: Configuration of additional (s1, s2) values and/or additional scaling factor - Component 4) Suggest an alignment with FG 34-1, i.e.,

|  |
| --- |
| ~~FFS:~~ #the number of unicast DCI limits for Pcell/PSCell scheduling* Processing one unicast DCI scheduling DL on Pcell/PSCell per Pcell/PSCell slot and its aligned N consecutive sSCell slot(s)
* Processing ~~one~~K unicast DCI scheduling UL on Pcell/PSCell per Pcell/PSCell slot and its aligned N consecutive sSCell slot(s)
* FFS: N is based on pair of (Pcell/PSCell SCS, sSCell SCS): N=1 for(15,15), (30,30), (60,60) and N=2 for (15,30), (30,60) and N=4 for (15, 60)
* K = 1 in case when both Pcell/PSCell and sSCell are FDD. Otherwise, K = 2
 |

- Component 10)Compared with the simplified UE operation of Type–A UE, more flexible search space set configuration would be preferred for Type-B UE. Therefore, we suggest the following:~~FFS:~~ PDCCH monitoring occasion(s) is within the first 3 OFDM symbols of a ~~Pcell/PSCell~~ slot of a corresponding scheduling cell (Pcell/PSCell or sSCell) |
| Xiaomi | FG 34-2:Component 2) : similar view as vivo and Samsung, ‘symbol’ should be removedComponent 6): If the FFS point under component 4) is adopted in the end, component 6) is no longer needed. Candidate value set: the combination with PCell/PSCell SCS other than 15 kHz should be in bracket in order to align with component 4);FG 34-2a:Share the same view with companies that it is not needed. |
| Nokia, NSB | Component 4 is not needed, the same components as with Rel-15 cross-carrier scheduling and Rel-16 cross-carrier scheduling with different SCS should be automatically included by corresponding FGs, if supported by the UE, and the ability for the PCell to be the scheduled cell does not impact those functionalities. This component should be removed.Component 7: okComponent 8: agree to remove.Component 9: agree to remove.Component 10: This is a minimum support as defined for Rel-15 Ues. The component is redundant and can be removed.Component 11: agree to remove.Component 12: no strong opinion on this component, but it is not strictly needed either.Component 13: agree to remove.FG 34-2a: not needed |
| Intel | Component 2: same view as other companies, overlapping [slot/symbol] of PCell/PSCell and sSCellComponent 3: we share same view as Samsung on (s1, s2) and 𝛽Component 10: same comments as ZTE, suggest to remove since it unnecessarily limit UE behavior on sSCell if the UE has a capability of FG 3-5b or other advance PDCCH monitoring capabilities. FG 34-2a: we are fine to remove it |
| Ericsson1 | FG 34-2: * Component 4) : We propose below updates, including clarifying that these limits are for P(S)Cell scheduling,

For P(S)Cell scheduling,* + - Processing K1 unicast DCI scheduling DL on PCell/PSCell per PCell/PSCell slot and its aligned N consecutive sSCell slot(s)
		- Processing ~~one~~ K2 unicast DCI scheduling UL on PCell/PSCell per PCell/PSCell slot and its aligned N consecutive sSCell slot(s)
		- FFS: N is based on pair of (PCell/PSCell SCS, sSCell SCS): N=1 for(15,15), (30,30), (60,60) and N=2 for (15,30), (30,60) and N=4 for (15, 60)
		- (K1, K2) = (1,1) for FDD P(S)Cell; (K1, K2) = (1,2) for TDD P(S)Cell
* Component 10): Do not support this restriction for 34-2. As a compromise OK to have UE report its support with or without restriction given in this component i.e. as below. Also OK to have Value 2 as a separate FG.
	+ UE reports one of the following candidate values
		- Value 1: PDCCH monitoring occasion(s) on PCell/PSCell and on sSCell for cross-carrier scheduling to PCell/PSCell is within the first 3 OFDM symbols of a PCell/PSCell slot.
		- Value 2: PDCCH monitoring occasion(s) on PCell/PSCell and on sSCell for cross-carrier scheduling to PCell/PSCell is not restricted to the first 3 OFDM symbols of a PCell/PSCell slot
* Component 7) : OK with updates.
* Component 8),9), 11), 12), 13) : OK to delete.

FG 34-2a* component description should be “Support of Cross-carrier scheduling (CCS) from sSCell to PCell/PSCell (Type B ) with ~~frame boundary alignment~~ non-aligned frame boundary between PCell/PSCell and sSCell”?
 |
| Qualcomm | Same comments as for FG34-1 and 34-1a. |

# Issue 3: FG 35-1

After review of contributions submitted to RAN1 #108-e in this agenda item, the following is proposed by the moderator. Companies submitted the following views on the moderator’s proposals.

**Proposal: Adopt the following changes highlighted in chromatic fonts, while keeping the yellow highlighting, if any, as shown**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  35. LTE\_NR\_DC\_enh2 | 35-1 | Aperiodic ~~TRS~~ CSI-RS for tracking for fast SCell activation | 1. Aperiodic CSI-RS ~~TRS~~ for tracking for fast SCell activation is ~~aperiodic and~~ triggered by enhanced SCell activation/deactivation MAC Ces
2. ~~Temporary RS is based on aperiodic TRS~~
3. ~~Temporary~~ Aperiodic CSI-RS for tracking for fast SCell activation is triggered within the BWP indicated by firstActiveDownlinkBWP-Id for the sSCell
4. A P-TRS of the to-be-activated Scell is indicated as a QCL source for the ~~temporary~~ aperiodic CSI-RS for tracking for fast SCell activation in case of known Scell same as existing specification
5. ~~FFS:~~ Maximum number of ~~temporary~~ aperiodic CSI-RS resource sets for tracking for fast SCell activation that can be configured to UE per CC is ~~{1 …~~ 16~~}~~
6. ~~FFS:~~ Maximum number of ~~temporary~~ aperiodic CSI-RS resource sets for tracking for fast SCell activation that can be configured to UE across CCs is ~~{1 …~~ 256~~}~~
7. ~~FFS: Maximum number of triggering states for temporary RS based Scell activation by a MAC-CE {1 … 64}~~
8. ~~FFS: Maximum number of temporary RS resource sets that can be associated with a triggering state {1 … 16}~~
9. ~~FFS: Support of temporary RS based SCell activation on one or more from {FR1 FDD, FR1 TDD, FR1 unlicensed, FR2}~~
10. For operation without shared spectrum channel access, the bandwidth of the aperiodic CSI-RS for tracking for fast for SCell activation is the minimum of 52 and resource blocks, or is equal to resource blocks. For operation with shared spectrum channel access, the bandwidth of the aperiodic CSI-RS for tracking for fast is the minimum of 48 and resource blocks, or is equal to resource blocks.

~~[Note: following are reported via the legacy feature, FG2-33~~ * ~~Maximum number of configured NZP-CSI-RS resources per CC~~
* ~~Maximum total number of simultaneous NZP-CSI-RS resources in active BWPs across all CCs~~
* ~~Maximum number simultaneous NZP-CSI-RS resources per CC~~
* ~~Maximum total number of CSI-RS ports in simultaneous NZP-CSI-RS resources in active BWPs across all CCs]~~
 | 6-5 | Yes | N/A |  | ~~[~~Per UE~~/Per BC/Per band]~~ | ~~[No/~~Yes~~]~~ | ~~[No/~~Yes~~]~~ |  | ~~[~~The NZP-CSI-RS configured as temporary RS for fast SCell activation are not considered when counting the maximum NZP-CSI-RS configurations of FG2-33~~]~~Note: RAN1 agreed it should be possible to separately indicate support of this FG based on whether the UE is operated with or without shared spectrum access. It is left to RAN2 how to implement this while leaving the type as “per UE” | Optional with capability signalling |

|  |  |
| --- | --- |
| Company | Comments/Questions/Suggestions |
| vivo | Regarding the granularity, we don’t support to define 35-1 as a UE level FG. Since FG 2-33(CSI-RS and CSI-IM reception for CSI feedback), FG 2-51 *csi-RS-ForTracking* and FG 2-51a *aperiodicTRS*(A-TRS triggered by DCI) are all per band reported, we don’t see a clear motivation to have a special treatment for A-TRS triggered by MAC CE for sScell fast activation. FG 35-1 should be per band reported as well.[Per UE/~~Per BC/~~Per band]

|  |  |
| --- | --- |
| ***csi-RS-ForTracking***Indicates support of CSI-RS for tracking (i.e. TRS). This capability signalling comprises the following parameters:- *maxBurstLength* indicates the TRS burst length. Value 1 indicates 1 slot and value 2 indicates both of 1 slot and 2 slots. In this release UE is mandated to report value 2;- *maxSimultaneousResourceSetsPerCC* indicates the maximum number of TRS resource sets per CC which the UE can track simultaneously;- *maxConfiguredResourceSetsPerCC* indicates the maximum number of TRS resource sets configured to UE per CC. It is mandated to report at least 8 for FR1 and 16 for FR2;- *maxConfiguredResourceSetsAllCC* indicates the maximum number of TRS resource sets configured to UE across CCs. If the UE includes the field in an FR1 band, it shall set the same value in all FR1 bands. If the UE includes the field in an FR2 band, it shall set the same value in all FR2 bands. The UE supports a total number of resources equal to the maximum of the FR1 and FR2 value, but no more than the FR1 value across all FR1 serving cells and no more than the FR2 value across all FR2 serving cells. The UE is mandated to report at least 16 for FR1 and 32 for FR2.The UE is mandated to report *csi-RS-ForTracking*. | Band |
| ***aperiodicTRS***Indicates whether the UE supports DCI triggering aperiodic TRS associated with periodic TRS. | Band |

 |
| ZTE | It is more appropriate to capture component 4) and 10) in specification instead of UE capability. We propose to delete component 4) and 10). We can understand that it may be necessary to have “FR1/FR2 differentiation”. However, we don’t see any motivation to have “TDD/FDD differentiation” for this SCell activation capability. |
| Nokia, NSB | Component 5: OKComponent 6: OKComponent 7: Perhaps better to keep it, where the maximum is 256. Zero-value means no TRS triggered in this SCell and 255 ScellActivationRS-ConfigIDs each pointing to an ScellActivationRS-Config can be configured.Component 8, 9: OK to remove |
| Ericsson1 | According to RAN2 agreements (sent to RAN1 in R1-2200890), up to *maxNrofSCellActRS-r17* =255 RS configurations can be configured **per SCell** and one octet per SCell is indicated in the MAC CE. To align with the agreements, Component 5 should be updated to reflect this i.e., up to 256 instead on up to 16 (OK to discuss indication of one value from a value set but the possibility for UE to indicate max allowed by specification should be included). Also, further discussion is needed for component 6 given RAN2 agreement. Prefer to keep it FFS.  |
| Qualcomm | We are not OK with per-UE capability. It should be per-BC at least.Separate capability for licensed and unlicensed spectrum is necessary. In addition, it is necessary to be able to indicate separate capability for FR1 and FR2. |

# Issue 4: New FGs

The following new FGs were proposed in contributions submitted to RAN1 #108-e in this agenda item. **Please indicate in the table below which of these proposed FGs should be discussed during RAN1 #108-e.**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  34. NR-DSS | 34-3 | Further restriction to Type A | Support of monitoring DCI formats 0\_1,1\_1,0\_2,1\_2 on Pcell/PSCell USS set(s), | 34-1 | Yes | N/A |  | Per BC | No | No |  |  | Optional with capability signalling |
| 34. NR-DSS | 34-4 | Support of sSCell deactivation/activation  | Support of sSCell deactivation/activation when sSCell cross carrier scheduling to Pcell/PSCell is configured  | 34-1 or 34-2 | Yes | N/A |  | Per BC | No | No |  |  | Optional with capability signalling |
| 34. NR-DSS | 34-5 | Support of sSCell dormancy  | Support of sSCell dormancy when sSCell cross carrier scheduling to Pcell/PSCell is configured  | 34-1 or 34-2 | Yes | N/A |  | Per BC | No | No |  |  | Optional with capability signalling |
| 34. NR-DSS | 34-6 | Precoder-granularity of CORESET size when CCS from sSCell to Pcell/PSCell is configured | 1. Precoder granularity of CORESET size can be configured {on sSCell, on PCell/PSCell, or on both sSCell and PCell/PSCell}
2. Candidate pair(s) of frequency band(s) for {PCell/PSCell, sSCell} among the candidate pair(s) reported in FG34-1 or FG34-2
 | 34-1 or 34-2 | Yes | N/A |  | Per BC | No | No |  |  | Optional with capability signalling |
| 34. NR-DSS | 34-7 | sSCell dormant BWP operation | BD and CCE handling on P(S)Cell based on the scaling factor a is unchanged regardless of whether the sSCell BWP is dormant/non-dormant | 34-1 or 34-2 | Yes | N/A |  | Per BC | No | No |  |  | Optional with capability signalling |
| 35. LTE\_NR\_DC\_enh2 | 35-2 | Additional bandwidth for TRS for SCell activation | Indicates the UE supported TRS bandwidths, in addition to 52 RBs, for a 10MHz UE channel bandwidth. This field only applies to the BWPs configured with 52 RBs size and 15kHz SCS, in FDD bands.UE inidicates either set 1 or set 2, where:- Supported bandwidth in set 1: {28, 32, 36, 40, 44, 48} RBs- Supported bandwidth in set 2: {32, 36, 40, 44, 48} RBs |  | Yes | N/A |  | Per band | FDD only | FR1 only |  |  | Optional with capability signalling |

|  |  |
| --- | --- |
| Company | Comments/Questions/Suggestions |
| Apple | For CCS enhancement for DSS enhancement, we support FG34-3, FG34-4, FG34-5 |
| vivo | **34-3:** there is no need to introduce additional FG for the support of DCI format 0\_2,1\_2, the following changes where the legacy UE capability ***dci-Format1-2And0-2-r16*** is directly used to indicate the support DCI format X\_2 would be sufficient. We are open to the additional FG of monitoring DCI formats 0\_1,1\_1 on Pcell/PSCell.1. ~~FFS:~~ USS set(s) for DCI format 0\_1,1\_1~~,0\_2,1\_2~~ configured on sSCell for CCS from sSCell to PCell/PSCell and USS set(s) for DCI format 0\_2,1\_2 configured on sSCell for CCS from sSCell to PCell/PSCell if UE supports FG 11-1 (*dci-Format1-2And0-2-r16*)

**34-4/34-5:** These features are pending on WI discussion on UE behavior when sScell is deactivated/dormant, if there is no additional UE monitoring behavior is defined when sScell is deactivated/dormant, the legacy capability would be sufficient, and can be reused.**34-6:** not support. In R15/R16, the feature ***precoderGranularityCORESET*** is per UE defined, once UE indicates ***precoderGranularityCORESET***, it should be applied to all band. We don’t see a clear motivation for frequency band pair level indication as proposed by 34-6.

|  |  |
| --- | --- |
| ***precoderGranularityCORESET***Indicates whether the UE supports receiving PDCCH in CORESETs configured with CORESET-precoder-granularity equal to the size of the CORESET in the frequency domain as specified in TS 38.211 [6]. | UE |

**34-7:** Whether BD and CCE handling on P(S)Cell when sScell is dormant should be the same as when sScell is not dormant is still under discussion; it is suggested to wait for WI’s formal conclusion **35-2:** seems not needed. The legacy UE capability parameter ***trs-AdditionalBandwidth-r16*** introduced for R16 TEI can be reused. If UE indicates that it supports ***trs-AdditionalBandwidth*** as well as FG 35-1, it can be understood as that the UE supports TRS with additional BW set1/set2 for fast sScell activation. ***Trs-AdditionalBandwidth-r16***Indicates the UE supported TRS bandwidths, in addition to 52 RBs, for a 10MHz UE channel bandwidth. This field only applies for the BWPs configured with 52 RBs size and 15kHz SCS, in FDD bands.Value *trs-AddBW-Set1* indicates 28, 32, 36, 40, 44, 48 RBs.Value *trs-AddBW-Set2* indicates 32, 36, 40, 44, 48 RBs. |
| ZTE | We suggest to discuss these new FGs after we have finalized the design of FG34-1 and FG34-2. |
| Samsung | For DSS, we do not see the need for additional FGs 34-3/4/5/6/7.  |
| Nokia, NSB | We do not see a need for these new proposed FGs. |
| Intel | For 34-4/34-5, there is an ongoing discussion whether DCI for SCell dormancy indication can be transmitted on sSCell. We may come back to these FGs once there is an agreement.  |
| Ericsson1 | OK to not have further discussion for 34-3/4/5/6/7 |
| Qualcomm | In the main session, enhanced activation/deactivation and enhanced dormancy is to be discussed. Prefer to have FG34-3/4/7.We prefer to have FG34-6. FG355-2 is necessary to complement the additional bandwidth for special cases. |

# Discussion/Approval Items during RAN1 #108-e — Second Checkpoint

Based on the comments/questions/suggestions received by the first checkpoint, the following are the revised proposals and/or proposed agreements by the moderator. Companies submitted the following views on the moderator’s proposals.

***[Please submit all comments/questions/suggestions here, late comments/questions/suggestions submitted in Section 3 will not be considered]***

**General comments**

|  |  |
| --- | --- |
| Company | Comments/Questions/Suggestions |
|  |  |

# Issue 1: FG 34-1

Based on the comments/questions/suggestions received by the first checkpoint, the following is proposed by the moderator. Companies submitted the following views on the moderator’s proposals.

**Proposal: Adopt the following changes highlighted in chromatic fonts, while keeping the yellow highlighting, if any, as shown**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  34. NR\_DSS | 34-1 | Cross-carrier scheduling from SCell to PCell/PSCell ~~[~~with search space restrictions~~]~~ (Type A) | Support of Cross-carrier scheduling from sSCell to PCell/PSCell ~~[~~with search space restrictions~~]~~ (Type A)1. Cross-carrier scheduling from sSCell to PCell/PSCell with CIF
2. Search space restrictions~~FFS~~: sSCell USS set(s) (for CCS from sSCell to PCell/PSCell) and at least following search space sets on PCell/PSCell can only be configured such that UE does not monitor them in ~~same~~ overlapping [slot/symbol] of PCell/PSCell and sSCell
	* USS sets for DCI formats 0\_1,1\_1,0\_2,1\_2 ~~(if supported)~~
	* 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
	* 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
3. ~~FFS: BD limit handling and any configuration of associated parameters and UE reporting of any associated parameters~~ Configuration of scaling factor α for BD and CCE limit handling and PDCCH overbooking handling on P(S)Cell
4. ~~FFS:~~ The number of ~~#~~unicast DCI limits for PCell/PSCell scheduling
* Processing K1 ~~one~~ unicast DCI scheduling DL on PCell/PSCell per PCell/PSCell slot and its aligned N consecutive sSCell slot(s)
* Processing ~~one~~ K2 unicast DCI scheduling UL on PCell/PSCell per PCell/PSCell slot and its aligned N consecutive sSCell slot(s)
* FFS: N is based on pair of (PCell/PSCell SCS, sSCell SCS): N=1 for(15,15), (30,30), (60,60) and N=2 for (15,30), (30,60) and N=4 for (15, 60)
1. Same numerology between sSCell and P(S)Cell or sSCell SCS is larger than P(S)Cell SCS
2. ~~FFS:~~ USS set(s) for DCI format 0\_1,1\_1~~,0\_2,1\_2~~ configured on sSCell for CCS from sSCell to Pcell/PSCell and USS set(s) for DCI format 0\_2,1\_2 configured on sSCell for CCS from sSCell to PCell/PSCell if UE supports FG 11-1 (*dci-Format1-2And0-2-r16*)
3. ~~FFS:~~ sSCell USS set(s) (for CCS from sSCell to Pcell/PSCell) and Type0/0A/1/2 CSS sets on Pcell/PSCell for DCI formats with CRC not scrambled by C-RNTI/MCS-C-RNTI/CS-RNTI can be configured so that the UE can monitor~~s~~ them in overlapping [slot/symbol] of Pcell/PSCell and sSCell~~. FFS overlap handling~~
	1. 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’ is allowed
4. FFS: Support of monitoring DCI formats 0\_1,1\_1,0\_2,1\_2 on PCell/PSCell USS set(s)
5. ~~FFS: Support of sSCell deactivation/activation when sSCell cross carrier scheduling to PCell/PSCell is configured~~
6. ~~FFS: Support of sSCell dormancy when sSCell cross carrier scheduling to PCell/PSCell is configured~~
7. ~~FFS: PDCCH monitoring occasion(s) is within the first 3 OFDM symbols of a PCell/PSCell slot~~
8. ~~FFS: Numbers of CORESET configurations and search space sets on sSCell (for PCell/PSCell cross-carrier scheduling) per BWP are 1 and 3, respectively~~
9. ~~FFS: frame boundary alignment between PCell/PSCell and sSCell~~
10. ~~FFS: Precoder granularity of REG-bundle size when CCS from sSCell to PCell/PSCell is configured~~
 | 6-5 | Yes |  |  | Per BC | No | Applicable to FR1 only |  | ~~[~~Candidate value set ~~1~~: One or more of supported SCS combinations ({P(S)Cell SCS in kHz, sSCell SCS in kHz}) from following set are indicated by the UE: {15,15}, {15,30}, (15, 60) ~~for N=4~~,[ {30,30}, {30,60},{60,60}])[Candidate value set 2: frequency band pair(s) for {PCell/PSCell, sSCell}]Component 4 candidate values: (K1, K2) = {(1,1) for FDD P(S)Cell; (K1, K2) = (1,2) for TDD P(S)Cell, [(K1, K2) = (2,2) for FDD P(S)Cell; (K1, K2) = (2,4) for TDD P(S)Cell]}Note: The CCS from sSCell to PCell is applicable to FR1 only but there can be other SCells in FR2 configured for the UE | Optional with capability signalling |

|  |  |
| --- | --- |
| Company | Comments/Questions/Suggestions |
| Qualcomm | **Handling unaligned CA between P(S)Cell and sSCell**: RAN1 conclusion is following. We believe that no separate UE capability means that unaligned CA between P(S)Cell and sSCell using *ca-SlotOffset* **is not supported**. If companies think unaligned CA between P(S)Cell and sSCell is (automatically) supported, we object it due to the following conclusion we made. If the understanding is that unaligned CA between P(S)Cell and sSCell is not supported, then **component 14)** has to be kept.

|  |
| --- |
| **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
 |

**Component 2)**: the last sub-bullet “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” is not technically correct and should be deleted.**(K1, K2) values on component 4)**: we can accept this **if component 12) is kept there**. If component 12) is deleted, we do not accept the changes. To begin with, we do not understand why higher (K1, K2) values are necessary if component 12) is deleted. As further compromise, we are also OK to change component 12) as a capability as proposed by Ericsson:* + - UE reports one of the following candidate values
			* Value 1: PDCCH monitoring occasion(s) on PCell/PSCell and on sSCell for cross-carrier scheduling to PCell/PSCell is within the first 3 OFDM symbols of a PCell/PSCell slot.
			* Value 2: PDCCH monitoring occasion(s) on PCell/PSCell and on sSCell for cross-carrier scheduling to PCell/PSCell is not restricted to the first 3 OFDM symbols of a PCell/PSCell slot

**Component 8)**: The wording provided by Ericsson in the 1st round is more accurate and aligned with the RAN1 agreement. Propose to use it.8) sSCell USS set(s) (for CCS from sSCell to Pcell/PSCell) and Type0/0A/1/2 CSS sets on PCell/PSCell can be configured so that the UE monitors them in overlapping slot/symbol of PCell/PSCell and sSCell* 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’

**Component 13)**: if we delete this, the UE has to handle doubled numbers of CORESETs and search space sets for P(S)Cell, which is inconsistent with the framework we agreed so far (BD/CCE budget per scheduled cell unincreased, # of DCI sizes per scheduled cell unincreased, etc). In addition, this increases the complexity of PDCCH monitoring for a given scheduled cell. Therefore, we cannot accept deleting this.**Candidate value set 2**: Support.**Overlapping [slot/symbol]**: For Type-A, it should be overlapping ~~[~~slot~~/symbol]~~. For Type-B, it can be overlapping symbol. |
| ZTE | **Unaligned frame boundary CA:** Our understanding is that unaligned frame boundary between PCell and sSCell can be supported without any spec impact. From our perspective, as long as UE reports FG34-1 and FG18-7 for unaligned CA, then UE can support unaligned frame boundary between PCell and sSCell.**Component 13):** We support to delete this compoenent.**Candidate value set 2**: We propose to delete this. In section 4.2.7.13 of TS38.306, there are already multiple capabilities for UE to report which band/carrier can be configured as PCell (copying one of them as shown below). We don’t see the need to further have this Candidate value set 2.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ***fr1fdd-FR1TDD-CA-SpCellOnFR1FDD***Indicates whether the UE supports an FR1 FDD SpCell (and possibly SCells) when configured with an FR1 TDD SCell. | UE | No | No | No |

 |
| Apple | * We support Candidate value set 2. These are two different things between where SpCell can be configured and whether a sSCell can schedule SpCell
* Component 12 needs to tbe kept, this is the basic UE feature to mirror FG3-1
* Component 14 needs to be kept, we did not even agree to support unaligned SpCell and sSCell as an feature
 |
| Samsung | **Unaligned frame boundary CA:** We don’t need to link the unaligned CA into DSS UE feature. If RAN1 finally agree to support unaligned CA for sSCell, it is good enough for a UE to indicate Rel-16 FG 18-7 (CA with non-aligned frame boundaries) and FG34-1 (or 34-2) with corresponding band combination. Hence, we support current structure as is.**Component 2):** We see the point of Ericsson’s 1 round comment. In order to locate the relevant descriptions for search space set restriction together, our suggestion is as following. And it seems no one has concern on deleting ‘symbol’:2) Search space restrictions~~FFS~~: sSCell USS set(s) (for CCS from sSCell to PCell/PSCell) and at least following search space sets on PCell/PSCell can only be configured such that UE does not monitor them in ~~same~~ overlapping ~~[~~slot~~/symbol]~~ of PCell/PSCell and sSCell* + USS sets for DCI formats 0\_1,1\_1,0\_2,1\_2 ~~(if supported)~~
	+ 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
	+ ~~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~~

2a) 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’ 2c) 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’**Component 4):** Tend to agree with Nokia’s 1st round comment. We can live without component 4)**Component 8):** If above suggestion for component 2) is agreeable, we can delete entire component 8) **Component 12):** Ericsson’s compromise proposal is acceptable**Others:** OK to remove 10), 11), 13), 14), 15) |
| Ericsson2 | Component 2) : Same comment as Qualcomm. The last bullet is incorrect. There is no separate configuration for these CSS sets based on C-RNTI/MCS-C-RNTI/CS-RNTI. The bullet “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” should be deleted from this component. Component 8) : Same comment as Qualcomm. This should be revised as per our previous suggestion. 8) sSCell USS set(s) (for CCS from sSCell to Pcell/PSCell) and Type0/0A/1/2 CSS sets on PCell/PSCell can be configured so that the UE monitors them in overlapping slot/symbol of PCell/PSCell and sSCell* 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’

Notes column (Candidate value set 1,2) : We prefer to not separate 15 and 30 kHz P(S)Cell at this point. So suggest to keep all values in FFS. We are OK with QC proposal to agree to 30 kHz P(S)Cell together with candidate value set 2. *~~[~~Candidate value set ~~1~~: One or more of supported SCS combinations ({P(S)Cell SCS in kHz, sSCell SCS in kHz}) from following set are indicated by the UE: {15,15}, {15,30}, (15, 60) ~~for N=4~~,[ {30,30}, {30,60},{60,60}])**[Candidate value set 2: frequency band pair(s) for {PCell/PSCell, sSCell}]* |
| vivo | Component 2) and 8) : same view as QualcommComponent 4): Support (K1, K2) = {(1,1) for FDD P(S)Cell; (K1, K2) = (1,2) for TDD P(S)Cell; but we don’t see a need of having more #DCIs per MO. If the sScell is deactivated by gNB, it means the limited PDCCH capacity on Pcell should be sufficient, then there is no need to have more #DCIs per MO.[slot/symbol]: should be slot levelCandidate value set 1: there is no need to separate 15kHz Pcell SCS and other SCS, suggest removing the highlightingCandidate value set 2: support. The legacy IEs, such as fr1fdd-FR1TDD-CA-SpCellOnFR1FDD mentioned in ZTE’s comment, are per UE reported and are to indicate whether UE supports Spcell and sScell configured with different duplex modes and/or different FRs. They are not related to the function of candidate value set2. |

# Issue 2: FG 34-2

Based on the comments/questions/suggestions received by the first checkpoint, the following is proposed by the moderator. Companies submitted the following views on the moderator’s proposals.

**Proposal: Adopt the following changes highlighted in chromatic fonts, while keeping the yellow highlighting, if any, as shown**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  34. NR\_DSS | 34-2 | Cross-carrier scheduling from SCell to PCell/PSCell (Type B) – aligned CA | ~~[~~Support of Cross-carrier scheduling (CCS) from sSCell to PCell/PSCell (Type B)~~]~~ with frame boundary alignment between PCell/PSCell and sSCell1. Cross-carrier scheduling from sSCell to PCell/PSCell with CIF
2. sSCell USS set(s) (for CCS from sSCell to PCell/PSCell) and search space sets on PCell/PSCell can be configured so that the UE monitors them in overlapping [slot/symbol] of PCell/PSCell and sSCell
3. Configuration of scaling factor α for BD and CCE limit handling and PDCCH overbooking handling on P(S)Cell
4. ~~FFS:~~ The number of ~~#~~unicast DCI limits for PCell/PSCell scheduling
* Processing K1 ~~one~~ unicast DCI scheduling DL on PCell/PSCell per PCell/PSCell slot and its aligned N consecutive sSCell slot(s)
* Processing K2 ~~one~~ unicast DCI scheduling UL on PCell/PSCell per PCell/PSCell slot and its aligned N consecutive sSCell slot(s)
* FFS: N is based on pair of (PCell/PSCell SCS, sSCell SCS): N=1 for(15,15), (30,30), (60,60) and N=2 for (15,30), (30,60) and N=4 for (15, 60)
1. Same numerology between sSCell and P(S)Cell or sSCell SCS is larger than P(S)Cell SCS
2. ~~FFS:~~ USS set(s) for DCI format 0\_1,1\_1~~,0\_2,1\_2~~ configured on sSCell for CCS from sSCell to PCell/PSCell and USS set(s) for DCI format 0\_2,1\_2 configured on sSCell for CCS from sSCell to PCell/PSCell if UE supports FG 11-1 (*dci-Format1-2And0-2-r16*)
3. ~~FFS: Support of sSCell deactivation/activation when sSCell cross carrier scheduling to PCell/PSCell is configured~~
4. ~~FFS: Support of sSCell dormancy when sSCell cross carrier scheduling to PCell/PSCell is configured~~
5. ~~FFS: PDCCH monitoring occasion(s) is within the first 3 OFDM symbols of a PCell/PSCell slot~~
6. ~~FFS: Numbers of CORESET configurations and search space sets on sSCell (for PCell/PSCell cross-carrier scheduling)~~
7. ~~FFS: frame boundary alignment between PCell/PSCell and sSCell~~
8. ~~FFS: Precoder granularity of REG-bundle size when CCS from sSCell to PCell/PSCell is configured~~

Note: The SCell configured with Cross-carrier scheduling to Pcell/PSCell is referred to as ‘sSCell’ | 6-5 ~~[, 34-1]~~ | Yes |  |  | Per BC | No | Applicable to FR1 only |  | ~~[~~Candidate value set ~~1~~: One or more of supported SCS combinations ({P(S)Cell SCS in kHz, sSCell SCS in kHz}) from following set are indicated by the UE: {15,15}, {15,30}, (15, 60) ~~for N=4~~, [{30,30}, {30,60},{60,60}][Candidate value set 2: frequency band pair(s) for {Pcell/PSCell, sSCell}]Component 4 candidate values: (K1, K2) = {(1,1) for FDD P(S)Cell; (K1, K2) = (1,2) for TDD P(S)Cell}Note: The CCS from sSCell to Pcell is applicable to FR1 only but there can be other Scells in FR2 configured for the UE | Optional with capability signalling |

|  |  |
| --- | --- |
| Company | Comments/Questions/Suggestions |
| Qualcomm | **Handling unaligned CA between P(S)Cell and sSCell**: RAN1 conclusion is following. We believe that no separate UE capability means that unaligned CA between P(S)Cell and sSCell using *ca-SlotOffset* **is not supported**. If companies think unaligned CA between P(S)Cell and sSCell is (automatically) supported, we object it due to the following conclusion we made. If the understanding is that unaligned CA between P(S)Cell and sSCell is not supported, then **component 12)** has to be kept.

|  |
| --- |
| **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
 |

**Component 10)**: Same as for Type A, we propose to take 10) back. As further compromise, we are also OK to change component 10) as a capability as proposed by Ericsson:* + - UE reports one of the following candidate values
			* Value 1: PDCCH monitoring occasion(s) on PCell/PSCell and on sSCell for cross-carrier scheduling to PCell/PSCell is within the first 3 OFDM symbols of a PCell/PSCell slot.
			* Value 2: PDCCH monitoring occasion(s) on PCell/PSCell and on sSCell for cross-carrier scheduling to PCell/PSCell is not restricted to the first 3 OFDM symbols of a PCell/PSCell slot

**Component 11)**: if we delete this, the UE has to handle doubled numbers of CORESETs and search space sets for P(S)Cell, which is inconsistent with the framework we agreed so far (BD/CCE budget per scheduled cell unincreased, # of DCI sizes per scheduled cell unincreased, etc). In addition, this increases the complexity of PDCCH monitoring for a given scheduled cell. Therefore, we cannot accept deleting this.**Candidate value set 2**: Support. |
| ZTE | Similar view as for FG34-1.**Unaligned frame boundary CA:** Our understanding is that unaligned frame boundary between PCell and sSCell can be supported without any spec impact. From our perspective, as long as UE reports FG34-1 and FG18-7 for unaligned CA, then UE can support unaligned frame boundary between PCell and sSCell.**Component 10):** We support to delete this compoenent.**Candidate value set 2**: We propose to delete this. In section 4.2.7.13 of TS38.306, there are already multiple capabilities for UE to report which band/carrier can be configured as PCell (copying one of them as shown below). We don’t see the need to further have this Candidate value set 2.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ***fr1fdd-FR1TDD-CA-SpCellOnFR1FDD***Indicates whether the UE supports an FR1 FDD SpCell (and possibly SCells) when configured with an FR1 TDD SCell. | UE | No | No | No |

 |
| Apple | * We support Candidate value set 2. These are two different things between where SpCell can be configured and whether a sSCell can schedule SpCell
* Component 10 needs to tbe kept, this is the basic UE feature to mirror FG3-1
* Component 12 needs to be kept, we did not even agree to support unaligned SpCell and sSCell as an feature
 |
| Samsung | **Unaligned frame boundary CA:** Same comment for FG34-1 applies here. Correspondingly, FG name and component description for FG 34-2 should be updated* FG name: Cross-carrier scheduling from SCell to PCell/PSCell (Type B) ~~– aligned CA~~
* Component:: ~~[~~Support of Cross-carrier scheduling (CCS) from sSCell to PCell/PSCell (Type B)~~]~~ ~~with frame boundary alignment between PCell/PSCell and sSCell~~

**Component 2):** Remove ‘symbol’: overlapping ~~[~~slot~~/symbol]~~ of PCell/PSCell and sSCell**Component 4):** (Same comment as for FG34-1) Tend to agree with Nokia’s 1st round comment. We can live without component 4)**Component 10):** We think Type B UE is more flexible so that component 10) is not necessary. For the progress, Ericsson’s compromise proposal is acceptable**Others:** OK to remove 8), 9), 11), 12), 13) |
| Ericsson2 | For the FG: the text ‘– aligned CA’ should be deleted from the FG name, and the text “with frame boundary alignment between PCell/PSCell and sSCell” should be deleted from the components, unless a separate FG allowing combination of Type B UE with unaligned CA is introduced. Notes column (Candidate value set 1,2) : We prefer to not separate 15 and 30 kHz P(S)Cell at this point. So suggest to keep all values in FFS. We are OK with QC proposal to agree to 30 kHz P(S)Cell together with candidate value set 2. [Candidate value set 1: One or more of supported SCS combinations ({P(S)Cell SCS in kHz, sSCell SCS in kHz}) from following set are indicated by the UE: {15,15}, {15,30}, (15, 60) for N=4,[ {30,30}, {30,60},{60,60}])[Candidate value set 2: frequency band pair(s) for {PCell/PSCell, sSCell}] |
| vivo | Component 4): Same comments as 34-1Candidate value set 1: there is no need to separate 15kHz Pcell SCS and other SCS, suggest removing the highlightingCandidate value set 2: support. Same comments as 34-1 |

# Issue 3: FG 35-1

Based on the comments/questions/suggestions received by the first checkpoint, the following is proposed by the moderator. Companies submitted the following views on the moderator’s proposals.

**Proposal: Adopt the following changes highlighted in chromatic fonts, while keeping the yellow highlighting, if any, as shown**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  35. LTE\_NR\_DC\_enh2 | 35-1 | Aperiodic ~~TRS~~ CSI-RS for tracking for fast SCell activation | 1. Aperiodic CSI-RS ~~TRS~~ for tracking for fast SCell activation is ~~aperiodic and~~ triggered by enhanced SCell activation/deactivation MAC Ces
2. ~~Temporary RS is based on aperiodic TRS~~
3. ~~Temporary~~ Aperiodic CSI-RS for tracking for fast SCell activation is triggered within the BWP indicated by firstActiveDownlinkBWP-Id for the sSCell
4. ~~A P-TRS of the to-be-activated Scell is indicated as a QCL source for the temporary RS in case of known Scell same as existing specification~~
5. ~~FFS:~~ Maximum number of ~~temporary~~ aperiodic CSI-RS resource sets for tracking for fast SCell activation that can be configured to UE per CC is ~~{1 … 16~~ 256~~}~~
6. FFS: Maximum number of ~~temporary~~ aperiodic CSI-RS resource sets for tracking for fast SCell activation that can be configured to UE across CCs is ~~{1 …~~ 256~~}~~
7. FFS: Maximum number of triggering states for temporary RS based Scell activation by a MAC-CE {1 … 64}
8. ~~FFS: Maximum number of temporary RS resource sets that can be associated with a triggering state {1 … 16}~~
9. ~~FFS: Support of temporary RS based SCell activation on one or more from {FR1 FDD, FR1 TDD, FR1 unlicensed, FR2}~~

~~[Note: following are reported via the legacy feature, FG2-33~~ * ~~Maximum number of configured NZP-CSI-RS resources per CC~~
* ~~Maximum total number of simultaneous NZP-CSI-RS resources in active BWPs across all CCs~~
* ~~Maximum number simultaneous NZP-CSI-RS resources per CC~~
* ~~Maximum total number of CSI-RS ports in simultaneous NZP-CSI-RS resources in active BWPs across all CCs]~~
 | 6-5 | Yes | N/A |  | [Per UE/Per BC/Per band] | [No/Yes] | [No/Yes] |  | ~~[~~The NZP-CSI-RS configured as temporary RS for fast SCell activation are not considered when counting the maximum NZP-CSI-RS configurations of FG2-33~~]~~ | Optional with capability signalling |

|  |  |
| --- | --- |
| Company | Comments/Questions/Suggestions |
| Qualcomm | **Components 5) and 6)**: we missed that a single value 256 is captured on these components (i.e., changed to ~~{1 …~~ 256}). Our understanding is that a UE is able to report a max number of A-CSI-RS resource sets for tracking for fast SCell activation per CC and across CCs as UE capabilities, from the values {1, …, 256}. **The current formulation means that the UE shall support 256 resource sets per CC and across CCs, which we do not agree with**. **A UE should be able to report one value from the range {1 … 256}**. Propose to take them back as follows (light blue changes below).5) ~~FFS:~~ Maximum number of ~~temporary~~ aperiodic CSI-RS resource sets for tracking for fast SCell activation that can be configured to UE per CC is **{1 …** ~~16~~ 256**}**6) FFS: Maximum number of ~~temporary~~ aperiodic CSI-RS resource sets for tracking for fast SCell activation that can be configured to UE across CCs is **{1 …** 256**}****Component 9)**: If we delete this component, the UE has to support temp-RS based SCell activation on FR1 carriers and FR2 carriers **at one time, which must be problematic from IODT point of view**. Same issue for unlicensed band and for TDD/FDD. We believe **this component 9) shall be kept there**. Or alternatively, **we can consider per-band if component 9) has to be deleted**. At least for now, we prefer to keep it. |
| ZTE | **Component 9)**: we support to delete this component. One way to address Qualcomm’s concern is to make it as a per UE capability with FR1/FR2 differentiation and TDD/FDD differentiation. |
| vivo | Components 5) and 6): we share a smilar view as Qualcomm, the maximum number of aperiodic CSI-RS resource sets can be less than 256 as UE may indicate a value less than 256 Components 7): Regarding Nokia’s comment (‘7) Perhaps better to keep it, where the maximum is 256. Zero-value means no TRS triggered in this SCell and 255 ScellActivationRS-ConfigIDs each pointing to an ScellActivationRS-Config can be configured’), the intention is understood, but the wording ‘triggering state’ is confusing becase there it was for alt2, maybe it can be refined as ‘Maximum number of aperiodic CSI-RS for tracking for fast SCell activation by a MAC-CE’?Granularity: support per band/BC |

# Issue 4: New FGs

Based on the comments/questions/suggestions received by the first checkpoint, no new FGs are proposed by the moderator at this time.

|  |  |
| --- | --- |
| Company | Comments/Questions/Suggestions |
|  |  |

# Discussion/Approval Items during RAN1 #108-e — Third Checkpoint

Based on the comments/questions/suggestions received by the second checkpoint, the following are the revised proposals and/or proposed agreements by the moderator. Companies submitted the following views on the moderator’s proposals.

***[Please submit all comments/questions/suggestions here, late comments/questions/suggestions submitted in Section 4 will not be considered]***

**General comments**

|  |  |
| --- | --- |
| Company | Comments/Questions/Suggestions |
|  |  |

# Issue 1: FG

**Proposal: Adopt the following changes highlighted in chromatic fonts, while keeping the yellow highlighting, if any, as shown**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |

# Summary of Final Proposals for Agreements

This Section summarizes the final proposals for agreement in RAN1 #108-e by email. There are no tables for comments.

***[All comments must be directly made on the RAN1 email reflector]***

Companies can continue to update their comments in the previous Sections, however, these are no longer monitored by the moderator. Any such comments will be for archival purposes only and will not influence the outcome of this email discussion. Any objection to any of the proposals in this Section must be voiced directly on the RAN1 email reflector.

**Possible Agreement: Adopt the following changes highlighted in chromatic fonts, while keeping the yellow highlighting, if any, as shown**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |

# Conclusion

After further discussion on the RAN1 email reflector the following was agreed as part of this email discussion:

# References

1. R1-2200780, Updated RAN1 UE features list for Rel-17 NR after RAN1 #108-e, Moderators (AT&T, NTT DOCOMO, INC.)
2. R1-2200916, Rel-17 UE features for DSS and MR-DC, Huawei/HiSilicon
3. R1-2201129, Discussion on UE features for DSS, vivo
4. R1-2201179, Discussion on Rel-17 UE features for DSS, ZTE
5. R1-2201420, On UE features for DSS and LTE NR DC enhancements, Nokia/Nokia Shanghai Bell
6. R1-2201725, UE features for DSS, Intel Corporation
7. R1-2201801, Views on Rel-17 DSS UE features, Apple
8. R1-2201889, Discussion on UE features for DSS, CMCC
9. R1-2201938, Discussion on UE features for NR DSS, Xiaomi
10. R1-2202048, UE features for DSS, Samsung
11. R1-2202054, On UE features for DSS, MediaTek Inc.
12. R1-2202177, UE features for DSS and LTE\_NR\_DC\_enh2, Qualcomm Incorporated
13. R1-2202225, UE features for DSS and CA enhancements, Ericsson